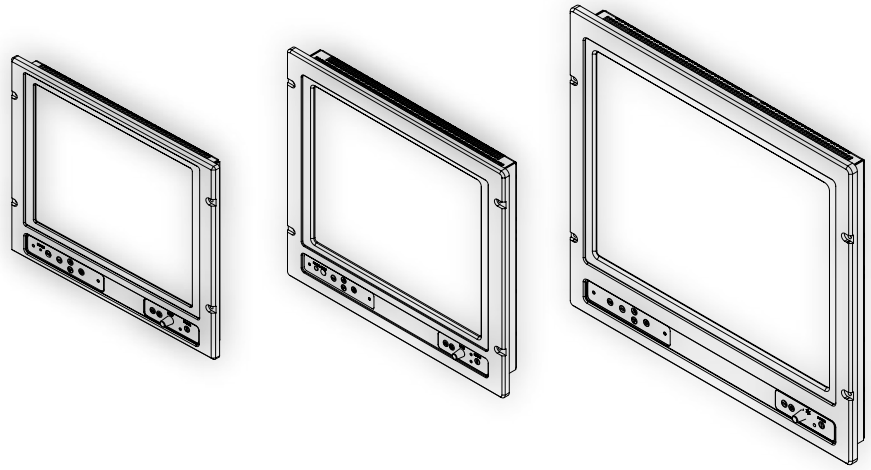
User Manual

HATTELAND™ DISPLAY



Military Multi Display Models

JH 19T01 MIL - 19.0 inch Maritime Multi Display (MIL)
JH 20T03 MIL - 20.1 inch Maritime Multi Display (MIL)
JH 20T04 MIL - 20.1 inch Maritime Multi Display (MIL)
JH 23T02 MIL - 23.1 inch Maritime Multi Display (MIL)

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User Manual MIL Series		
Updated: 18 Mar 2004	Doc Id: INB100005-3	
For models: -A1, -A2, -E1, -E2		Rev. 2

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Aamsosen
N-5578 Nedre Vats, Norway

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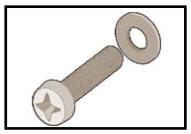
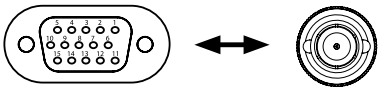
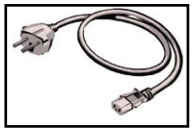
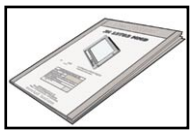
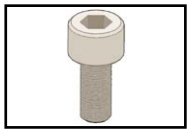
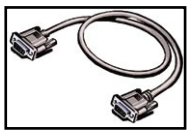
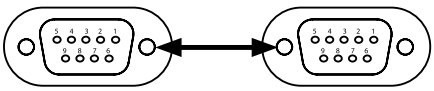
Contents of package

This product is shipped with:

Item	Description	Illustration
	4 pcs of PAN M6X25 black bolts with M6 plastic washer. **These should only be used to secure the display into a console.** *Note: If you prefer your own bolts, make sure they are minimum M6 and 25mm in length for security reasons.*	
	1 pcs of Standard BNC Signal Cable. DSUB 15P Male to BNC 5P Male - Length approx: 2m	
	1 pcs of Standard Power Cable. (European or US standard) - Length approx: 1.9m *Note: Power cable not included in the DC version.*	
	1 pcs of User Manual MIL	

Optional Accessories:

Item	Description	Illustration
	4 pcs of M6X12 Unbraco bolts (Included with bracket) **These should only be used to secure the bracket on the display.** If you prefer your own bolts, make sure they do not exceed 12mm in length. Use any longer will do serious damage to components inside the product!	
	1 pcs of Standard Serial Cable DSUB 9p Male to DSUB 9p Male - Length approx: 1.5m This cable is not included if you purchased a product with touchscreen or remote control serial interface installed.	

General

HATTELAND™ DISPLAY

Introduction to Jakob Hatteland Display
Jakob Hatteland Display AS is a fully owned Norwegian company. Since the start in 1987, the company have been involved in the maritime market. Today the company develops and manufactures a complete range of high quality and type approved products. The company is a major and leading supplier to the different maritime, naval and industrial markets.

The concept
All products are designed to meet the requirements for different applications in many environments. The products offered are based on high quality and state-of-the-art modules with the highest specifications. The concept enables to display professional applications with clarity and enhanced color and image quality. Integration in systems are made easy due to standardized products and features. All products are fully dimmable for night vision on bridge installations.

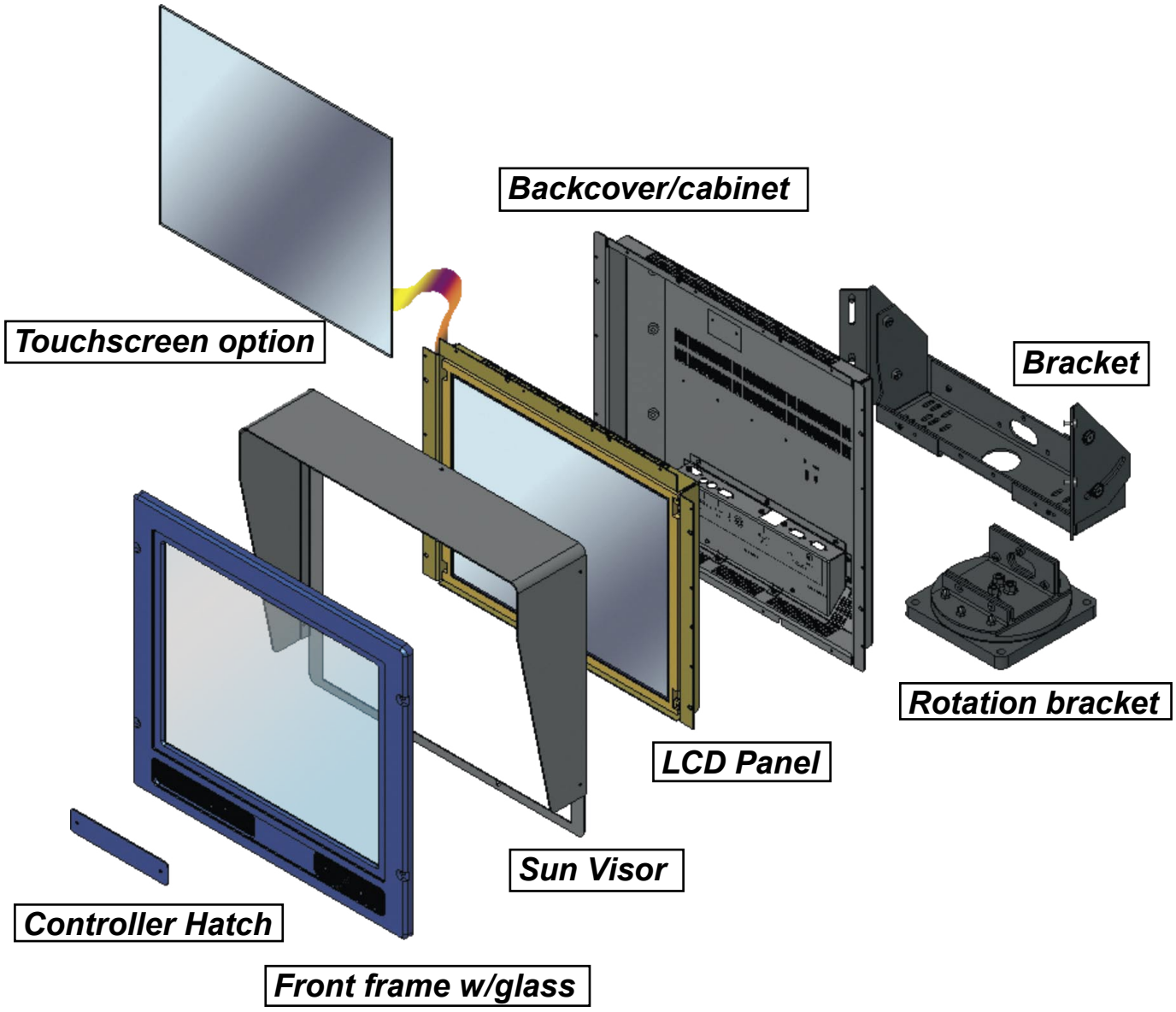
The product range
Jakob Hatteland Display AS has introduced the **MMD** - **M**aritime **M**ulti **D**isplay and the **MMC** - **M**aritime **M**ulti **C**omputer to the market. All products are part of the wide range of sizes and options, which are suitable for a vast array of different applications. Within the **MMD** range the products are complying with ECDIS & ARPA standards. The products can be delivered with standard accessories such as remote control, external power relay, video buffer, bracket, sun visor and touch screen. In addition to our standard products, custom adaptions can be arranged for colour, logo, mechanical design and electrical interfaces. Within the range of products, **MIL** tested units are available for naval applications.

About this manual
This manual contains information needed for service of the Hatteland displays. The manual contains also electrical, mechanical and input signal specifications. All specifications in this manual, due to manufacturing, new revisions and approvals, are subject to change without notice. **It is recommended that a service engineer read this manual before servicing the unit.**

The Hatteland Products
The products undergo thoroughly testing in accordance with maritime regulations. Standards such as the IEC945 (EN60945) are mandatory for the products. ECDIS products are also tested and approved by the BSH in accordance to the IEC61174 standard. The products are type approved by the worlds leading classification societies.

Furthermore, all products undergo thorough quality control before delivery, and are reinforced where necessary to withstand harsh working environments. Changes in the products, such as the removal of casings or the closing of existing ventilation openings, or improper mounting of the monitors, will lead to loss of approval; furthermore, our warranty for any resulting damage or malfunctions will become null and void.

Basic Construction, Hatteland Display Concept

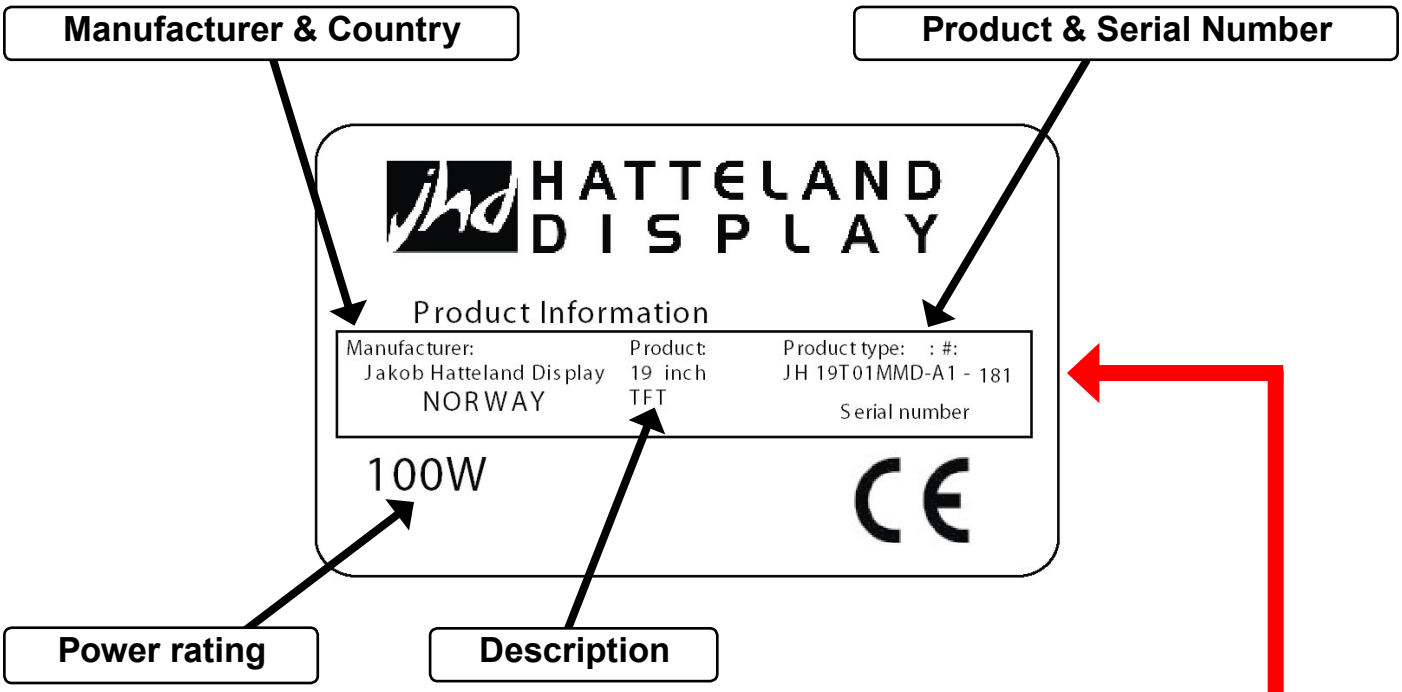


General Display Variations/Models Overview:

A1	= AC Power 115-230 VAC
A2	= DC Power 12-24 VDC (Some have 10-36 VDC)
A3	= AC Power 115-230 VAC including videobuffer
A4	= DC Power 12-24 VDC including videobuffer
C1/C3	= Touchscreen + AC Power 115-230 VAC
C2/C4	= Touchscreen + DC Power 12-24 VDC
E1	= ECDIS Compliant + AC Power 115-230 VAC
E2	= ECDIS Compliant + DC Power 12-24 VDC
MMD	= Dual Input (RGB + VIDEO) Display
MMC	= Complete Maritime Multi Computer + Display Solution
MIL	= Naval Military Dual Input (RGB + VIDEO) Display
STD/VGA	= Single Input RGB Signal

Product Labels (Example)

Serial Number Label



Product Type and Serial Number

```
JH XXAXX AAA-AX-XXX  NOMENCLATURE
JH 19T01 MMD-A1-181  Example
                     Serial Number
                     Sub Version (AC-Odd / DC-Even number)
                     Version (Number & Product Name)
                     TFT (Thin Film Transistor)
                     Display Size (inch)
                     Jakob Hatteland (manufacturer)
```

Warranty Label

If you are to perform service on a unit still under warranty, any warranty will be void. This label is located on the back of the product, and can not be removed without damaging the label. This is to help our service department to better determine if there has been any unauthorized service on the product still under warranty.

Installation Recommendations

Installation and mounting of displays

1. Most of our displays are intended for various methods of installation or mounting (panel mounting, bracket mounting, ceiling/wall mounting etc.); for details, please see the relevant mechanical drawings.

2. Adequate ventilation is a necessary prerequisite for the life of the display. The air inlet and outlet openings must definitely be kept clear; coverings which restrict ventilation are not permissible.

3. Do not install the unit in a horizontal position (laying down), as this will cause heat to build up inside the display which will damage the LCD Panel. To prevent this problem we recommend installing the unit in a vertical position (±30 degrees) to improve the airflow through the unit.

4. Exposure to direct sunlight can cause a considerable increase in the temperature of the unit, and might under certain circumstances lead to overtemperature. This point should already be taken into consideration when the bridge equipment is being planned (sun shades, distance from the windows, ventilation, etc.)

5. Space necessary for ventilation, for cable inlets, for the operating procedures and for maintenance, must be provided.

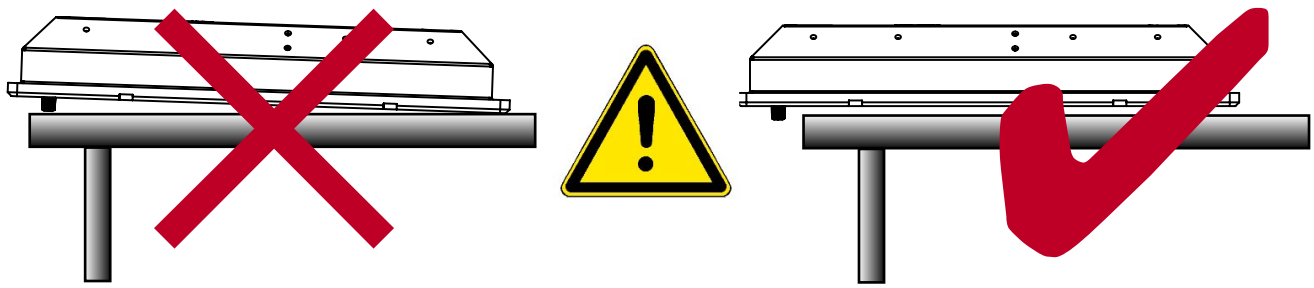
6. To further improve the cooling of the unit we recommend installing Cooling Fans underneath blowing upwards into the unit air inlet. This may be required in high temperature applications and also when there is reason to expect temperature problems due to non-optimal way of mounting(Ref.2-5).

7. If the push buttons of the display are not illuminated, an external, dimmable illumination (IEC 60945, 6.5.c, e.g. Goose neck light is required for navigational use.

8. Information about necessary pull-relievers for cables is given in the installation drawings. Attention must be paid to this information so that cable breaks will not occur, e.g. during service work.

Brightness knob precaution

Please be aware of the risk of breaking or bending the brightness knob. The brightness knob should be free of any obstruction.



Installation Recommendations

Ergonomics

1. Adjust the unit height so that the top of the screen is at or below eye level. Your eyes should look slightly downwards when viewing the middle of the screen.

2. Adjust screen inclination to remain gaze angle to the centre of the screen approximately perpendicular to the line of gaze.

3. When screen are to be operated both from a sitting position and from a standing position, a screen inclination of about 30° to 40° (from a vertical plane) has turned out to be favourable.

4. The brightness of displays is limited. Sunlight passing directly through the bridge windows - or its reflection - which falls upon the screen workplaces must be reduced by suitable means (negatively inclined window surfaces, Venetian blinds, distance from the windows, dark colouring of the deckhead)

5. Units in the bridge wing area must be installed or mounted by suitable alignment or bulkhead/ deckhead mounting in such a way that reflections of light from the front pane of the display are not directed into the observer's viewing direction.

6. The use of ordinary commercial filter plates or filter films is not permitted for items of equipment that require approval (by optical effects, "aids" of that kind can suppress small radar targets, for example).

General mounting instructions

- The useful life of the components of all Electronics Units generally decreases with increasing ambient temperature; it is therefore advisable to install such units in air-conditioned rooms. If there are no such facilities these rooms must at least be dry, adequately ventilated and kept at a suitable temperature in order to prevent the formation of condensation inside the display unit.

- With most Electronic Units, cooling takes place via the surface of the casing. The cooling must not be impaired by partial covering of the unit or by installation of the unit in a confined cabinet.

- In the area of the wheel house, the distance of each electronics unit from the magnetic standard compass or the magnetic steering compass must not be less than the permitted magnetic protection distance.

This distance is measured from the centre of the magnetic system of the compass to the nearest point on the corresponding unit concerned.

- Units which are to be used on the bridge wing must be installed inside the "wing control console" protected against the weather. In order to avoid misting of the viewing screen, a 25 ... 50 W console-heating (power depending on the volume) is recommended.

- When selecting the site of a display unit, the maximum cable lengths have to be considered.

Installation Recommendations

- The impairment of read-out from a display screen by direct light from lamps or the sun must be avoided. Rear windows must be blacked out by means of roller blinds or Venetian blinds.

- Disturbing reflections on the screen of a display caused by pilot lamps and illuminated signs must be prevented by suitable measures (screening or relocating).

- When a display is being installed, the surface base or bulkhead must be checked to ensure that it is flat in order to avoid twisting of the unit when the fixing screws are tightened, because such twisting would impair mechanical functions. Any unevenness should be compensated for by means of spacing-washers.

- The grounding screws of the units must be connected to the body of the ship (ground); the wire used should have a cross sectional area of at least 6 mm^2.

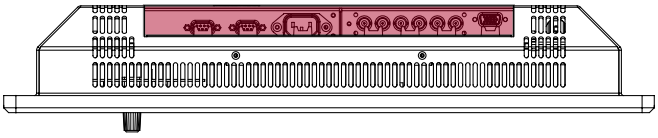
- Transportation damage, even if apparently insignificant at first glance, must immediately be examined and be reported to the freight carrier. The moment of setting-to-work of the equipment is too late, not only for reporting the damage but also for the supply of replacements.

Cables

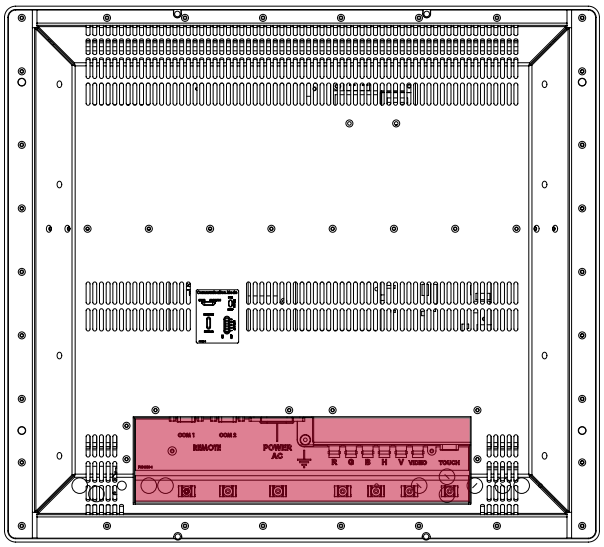
Use only high quality shielded signal cables with separate coax for Red, Green and Blue. (RGB)
If your product have an DVI-D connector, use only high quality DVI cables. Jakob Hatteland Display can supply a varity of high quality RGB and DVI cables intended for this use.

Cable Entries & Connectors (Marked area) - Illustration only

Bottom View



Back View



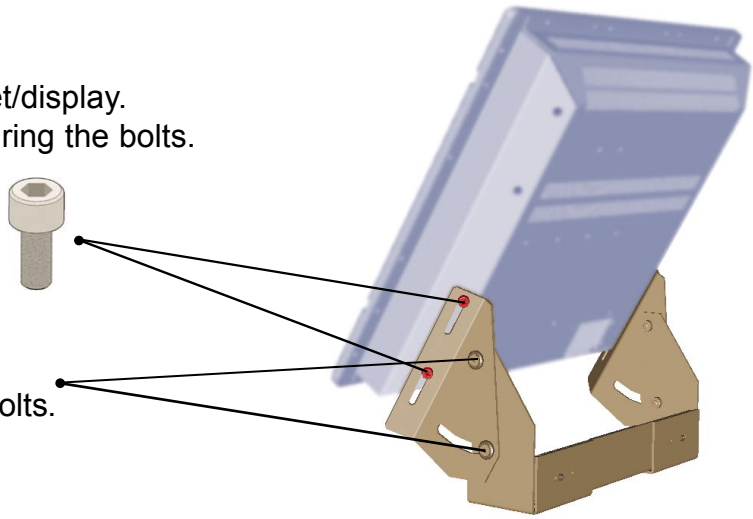
Installation Recommendations

Maximum Cable Length
The RGB/DVI cable should generally be kept as short as possible to provide a high quality output on the display. The maximum cable length will depend on the signal resolution and frequency, but also on the quality of the signal output from the computer. We recommend using 60Hz vertical frequency for our displays.

Cables up to 10 meters generally provides good picture quality even with a 1600x1200 (UXGA) 60Hz signal. In most cases (especially with lower resolutions) even longer cables will provide a satisfactory result. This should however be tested in advance before making the decision on how far the unit can be placed from the signal source.

Standard Bracket
When mounting the bracket on the MIL products, the length of the bolts should not exceed 12mm. Using any longer bolts will do serious damage to components inside the product, and will void warranty!

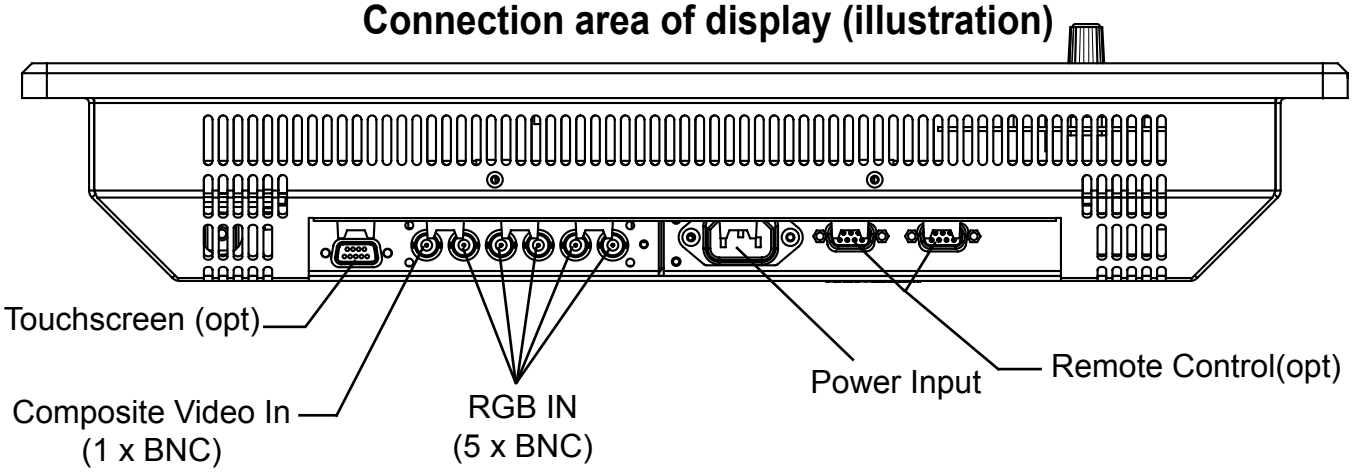
Mount bolts on both sides of the bracket/display.
You make any adjustments before securing the bolts.



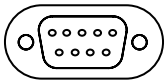
Adjust the tilting angle and secure the bolts.

Rotary Bracket
This can only be mounted if your product is equipped with a **Standard Bracket**.
Use the provided bolts to secure it. You may choose your own bolts to secure it to a table or desktop, recommended size are: M10 and minimum 30mm in length.

Connection area of display (illustration)



NOTE: There is no Composite Video In on JH 20T03 MIL model.



TOUCHSCREEN: (optional)

Connect the RS-232 cable to the D-SUB 9P Connector (female) on the rear side of the TFT display. Connect the other end to your COM port of your computer. Install the nesscessary software needed to operate it.

- Note that the connector is only installed upon customer request.

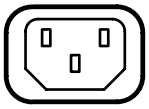
COMPOSITE VIDEO IN (PAL/NTSC/SECAM VIDEO):

Connect your composite video signal cable into the BNC plug. To activate the Picture In Picture function, the TFT display must be configured via the OSD menus.

- Note that *Composite Video* must be selected as the incoming video source.

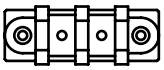
RGB IN: (RGBHV)

Connect the BNC cable to the 5 x BNC Connectors (female) on the rear side of the TFT display.
To reduce tension of the cables, secure it to the base mounted cable tie clamp. Connect the other end of the cable to the VGA output of your computer, and fasten it there also.



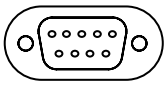
POWER INPUT: (AC Version)

The internal AC power module supports both 115VAC/60Hz and 230/50Hz power input. You may secure the cable further by mounting it to the base mounted cable tie clamp.



POWER INPUT: (DC Version)

Secure the cables (check polarity!) to the screw terminal, you may secure the cable further by mounting it to the base mounted cable tie clamp. The internal DC power module supports voltage from 12 to 24 VDC.



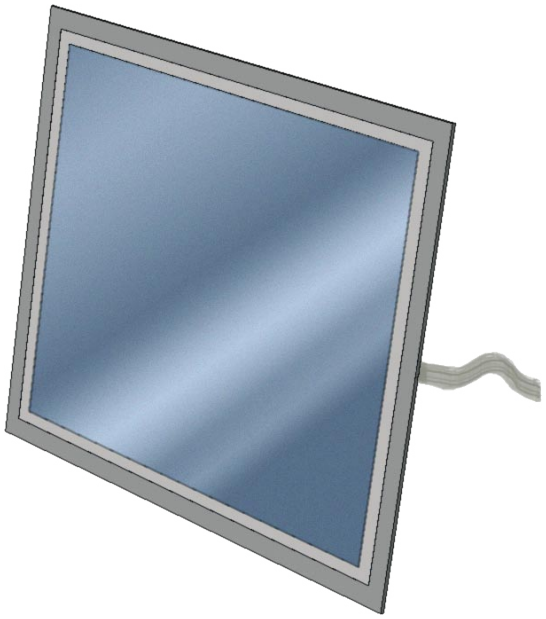
REMOTE CONTROL:

The two serial remote control connectors are used for displays with the JHSCOM-A1 or JHSCOM-B1. It features a RS232/RS422/RS485 interface for controlling all parameters, including brightness, for the display. For further information on usage, see the “Control Interface” section in this manual.

Capacitive Touchscreen

Introduction to Jakob Hatteland Display products with touchscreen
JHD uses both Resistive and Capacitive touchscreen solutions for their products. Please visit our website to verify what product and touchscreen solution your product have.

Capacitive Touchscreen
Capacitive touchscreens operate using oscillator circuits that are located in each corner of the glass overlay and measure the capacitance of the area to be “touched”. Depending on where the user touches the overlay, the oscillators will vary in frequency. A touchscreen controller then measures the frequency variations to ascertain the coordinates of the person’s touch. This glass overlay has a coating that stores the charge deposited over its surface electrically. It will not operate with either a gloved hand or with a mechanical stylus.



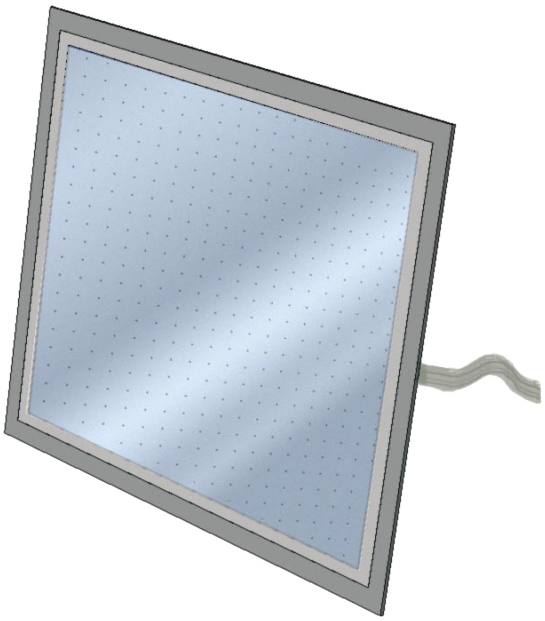
Brief Specifications

Subject	Details
Construction	**Top:** ClearTek protective overcoat protects the sensors and increase durability. **Inside:** Electrode X/Y grid pattern and conductive coating. **Bottom:** Glass and conductive coating. Small amount of voltage is applied to the four corners for measuring X and Y coordinates of the touch point.
Positional Accurancy	Reported touch coordinates are within 1.0% of true position. (Based on viewing area dimensions)
Touch Contact Requirements	3 ms for finger input.
Enduarance Tested	More than 225 million touches in one location without noticable degradation to the surface.
Cleaning	Water, isopropyl, alcohol, and similar non-abrasive cleaners.
Liquid Resistance	Liquids on screen does not impede touchscreen performance.
Light Transmission	Up to 88% at 550 nm; dependant on specific surface finish chosen.

Updated touchscreen drivers and documentation for your operating system:
Please visit our website www.hatteland.com (click on support, and then touchdrivers) for 3rd party software, drivers and complete documentation for touchscreens.

Resistive Touchscreen

Resistive Touchscreen
It generally uses a display overlay composed of layers, each with a conductive coating on the interior surface. Special separator “dots” are distributed evenly across the active area and separate the conductive interior layers.



The pressure from using either a mechanical stylus or finger produces an internal electrical contact at the “action point” which supplies the controller with vertical and horizontal analog voltages for data input. The resistive touchscreens are anti-glare to reduce reflective shine intensity, which will slightly diffuse the light output throughout the screen. Resistive technology activation can be initiated by; a gloved hand, fingernail, mechanical stylus or an ungloved finger.

Brief Specifications

Subject	Details
Construction	**Top:** Polyester with outside hard-surface coating with clear or anti-glare finish. **Inside:** Transparent conductive coating. **Bottom:** Glass substrate with uniform conductive coating. Top and bottom layers separated by separator dots.
Positional Accurancy	Standard deviation of error is less than +- 0.080-inch (2mm).
Touch Activation Force	Typically 57 to 133 g
Expected Life Performance	More than 35 million touches in one location without failure, using a stylus similar to a finger.
Chemical Resistance (Exposed for one hour)	Acetone, Ammonia-based glass cleaners, Common food and beverages, Hexane, Isopropyl alcohol, Methylene chloride, Methyl ethyl ketone, Mineral spirits, Turpentine
Light Transmission	Typically 75% over visible light spectrum.

Updated touchscreen drivers and documentation for your operating system:
Please visit our website www.hatteland.com (click on support, and then touchdrivers) for 3rd party software, drivers and complete documentation for touchscreens.

User Controls
MIL Products

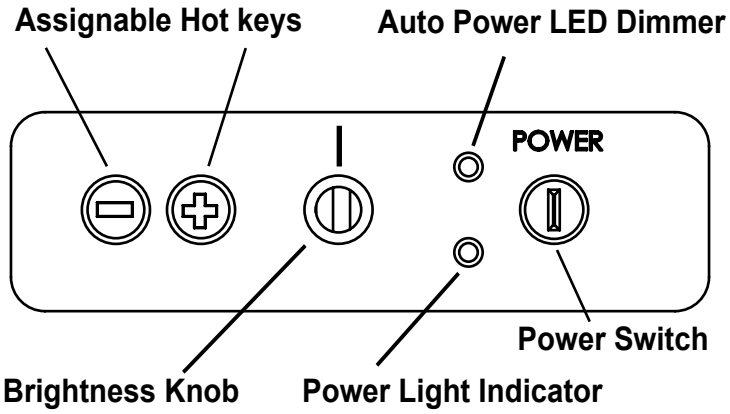
POWER SWITCH:

This TFT display features a Instant-ON/Delay-OFF switch, which ensures that the display is not turned off by user accident.

Power ON: To turn the display on, press down the power switch. The power light indicator will turn green.

(If no RGB signal sync is present, "NO SYNC" message will appear in the display)

Power OFF: To turn the display off, press and hold the power switch down for 3 seconds.



DISPLAY ADJUSTMENT CONTROLS:

This TFT display features a 100% dimmable image, which means it is capable of displaying a completely black image when the BRIGHTNESS knob is turned fully to the left.

NOTE: The design and placement of the user / osd controls may vary from product to product !

AUTOMATIC POWER LIGHT DIMMING:

This TFT display features a Power LED Dimmer function which control the light intensity of the power light indicator. There are two different solutions for this feature.

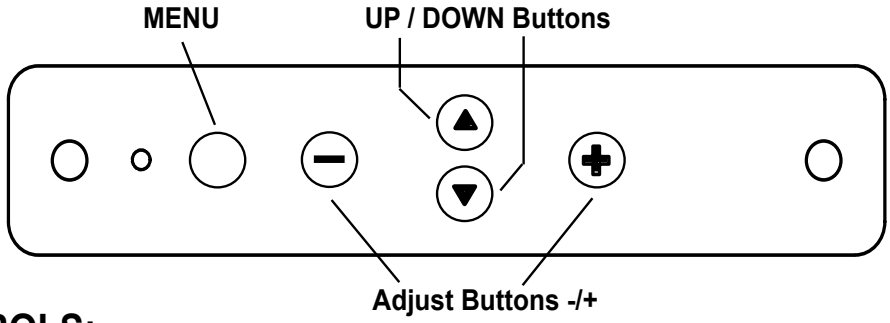
1- Intelligent Auto Power LED Dimmer which control the light intensity based on your environment lightning. This can also be manually adjusted using the Led Adjust knob on the rear side of the display.
2- The light intensity is regulated according to the backlight, that is according to the brightness knob. With the exception that when the backlight brightness is zero, the power led is just visible in dark environment. This means that the power led is not visible in daylight when the brightness knob is turned fully to the left.

Note:

If there is a led adjustment knob at the connection area of the display as described in **"INSTALLATION AND RECOMMENDATIONS"** chapter, the manner of operation described in paragraph one applies. For displays produced after the creation date of this manual, paragraph two applies. For displays produced before year 2002, paragraph one applies.

ASSIGNABLE HOT KEYS:

The user can assign various display functions as hot keys (increase/decrease).
This will enable the user to quickly adjust the brightness, image size, contrast or other functions to control the image. To assign these hot keys, enter the **"UTILITIES MENU/DIRECT ACCESS"** menu and change them to the desired hot key function. Default hot keys are set to increase/decrease volume.



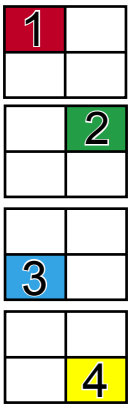
USER CONTROLS:

The On Screen Display (OSD menu) controls are located under the metal hatch on the left side of the display. To begin understanding the menu and its usage, just follow these steps for a quick start.

1: Press the “MENU” button. The OSD menu will show all the available functions you can adjust or control.
2: You can move to the next icon by pressing “MENU”.
3: Select options within icon menu by pressing “UP” or “DOWN” buttons. The selected option will turn yellow.
4: Use “+” or “-” buttons to increase/decrease values.
5: Move the selection left or right by using “+” or “-” buttons. The selected option will turn green.
6: To confirm the selection, press “+” button. To abort press “-” button.

OSD MENU:

The On Screen Display (OSD menu) contains several functions that will let the user to adjust or setup the display to their preferred setting. The functions are shown as easy understandable icons. Some of the menus have sub-menus, use “+” to access and “MENU” to go back to the previous menu. The OSD menu consists of 4 modes: (Icon beside function indicates if it’s available in that mode)



Mode 1 - Available functions in **RGB / DVI* MODE Simplified OSD Menu - (Logo will appear)**
User can adjust the most common functions needed to operate the display.
**Some functions are not available in DVI mode*

Mode 2 - Available functions in **RGB / DVI* MODE Advanced OSD Menu - (No logo will appear)**
User can access more advanced functions. (Service menu)
**Some functions are not available in DVI mode*

Mode 3 - Available functions in **VIDEO MODE Simplified OSD Menu - (Logo will appear)**
User can adjust the most common functions needed to operate the display.

Mode 4 - Available functions in **VIDEO MODE Advanced OSD Menu - (No logo will appear)**
User can access more advanced functions. (Service menu)

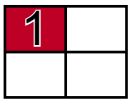
RGB/DVI MODE = When RGB/DVI signal (i.e OS or radar / charts) are displayed full screen.
VIDEO MODE = When video signal (i.e CAMERA / VCR / DVD) are displayed full screen.

To access the “Advanced” OSD Menu, you must press and hold the “DOWN” button while turning power on. When picture appears, release the “DOWN” button and press “MENU” to access the “Advanced” functions. If you have the “Memorized state” version of the OSD menu, use the same procedure to switch between “Advanced” or “Simplified” modes. For more information about “Memorized state”, see the “NOTES” section in this manual.

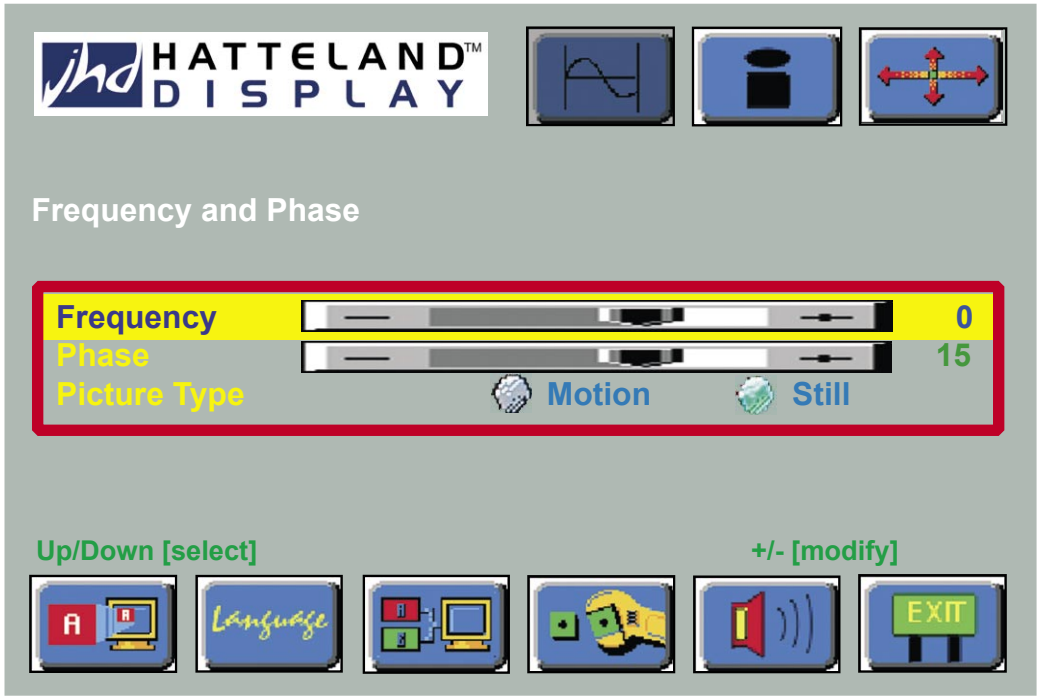
WARNING !! ONLY A QUALIFIED SERVICE ENGINEER SHOULD ACCESS SERVICE MENU PERFORMANCE OF THE DISPLAY MAY BE SERIOUSLY AFFECTED.

OSD Menu Overview

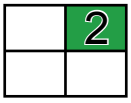
Mode 1 - Function layout in **RGB / DVI MODE Simplified OSD Menu: (User menu)**



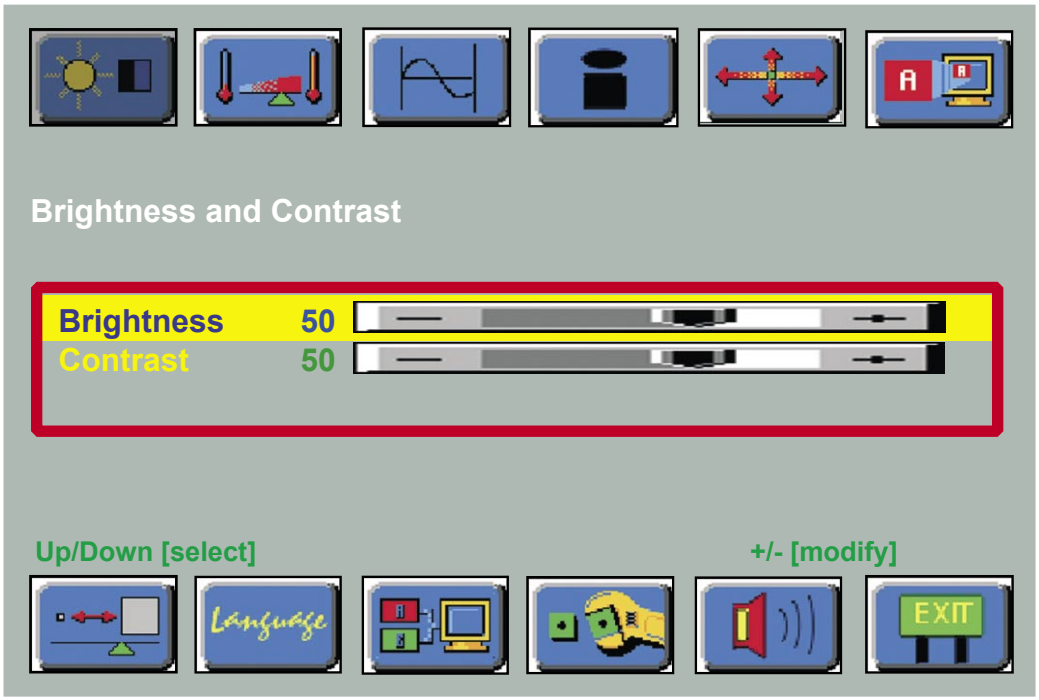
Note that to be in RGB / DVI MODE, a computer signal must be present in full screen, i.e Windows or other operating system/radar system. Having a PIP view simultaneously will not interfere or change the menu structure in any way.



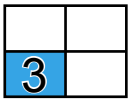
Mode 2 - Function layout in **RGB / DVI MODE Advanced OSD Menu: (Service menu)**



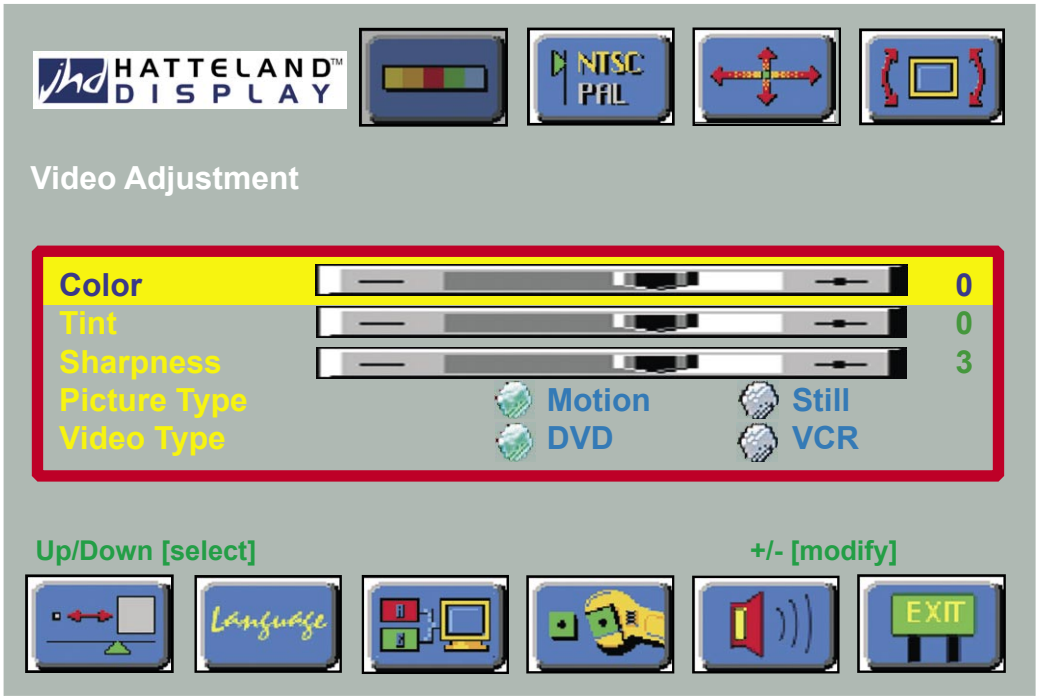
Note that to be in RGB / DVI MODE, a computer signal must be present in full screen, i.e Windows or other operating system/radar system. Having a PIP view simultaneously will not interfere or change the menu structure in any way.



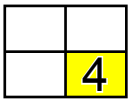
Mode 3 - Function layout in **VIDEO MODE Simplified OSD Menu: (User menu)**



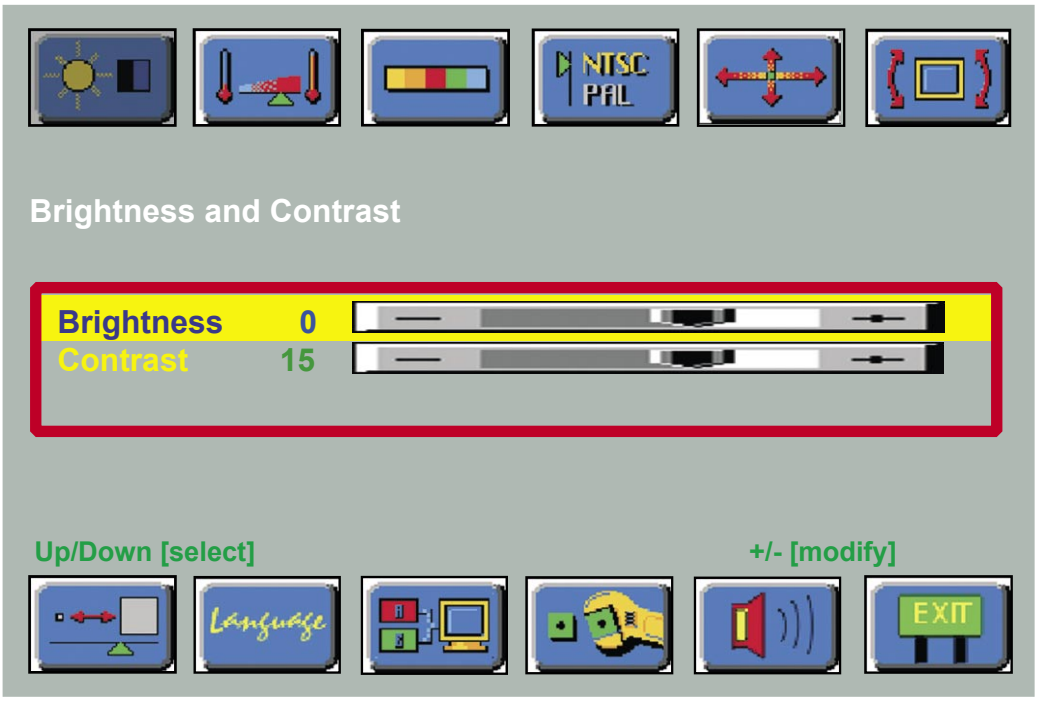
Note that to be in VIDEO MODE, a video signal must be present in full screen, i.e from a camera, VCR or DVD player.



Mode 4 - Function layout in **VIDEO MODE Advanced OSD Menu: (Service menu)**

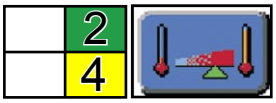


Note that to be in VIDEO MODE, a video signal must be present in full screen, i.e from a camera, VCR or DVD player.



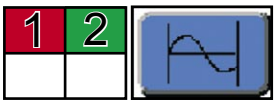
BRIGHTNESS AND CONTRAST: (No function in DVI mode)
Selecting this function will enable the user to adjust brightness and contrast for the display.

BRIGHTNESS: Increase/decrease brightness level, total: 100 steps
CONTRAST: Increase/decrease contrast level, total: 100 steps



COLOR TEMPERATURE:
Selecting this function will enable the user to modify the warmness of the picture. Higher temperature = "cooler" picture. Lower temperature = "warmer" picture.

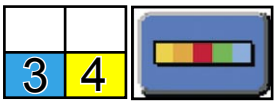
User can select between *9500K, 8000K, 6500K,* and *5000K* color temperature measured in Kelvin degrees. Press "+" to access the sub-menu, where the RGB values can be adjusted. Use "+" and "-" buttons to adjust these values, and "MENU" to exit. (Saving is done automatically)



FREQUENCY AND PHASE: (No function in DVI mode)
Selecting this function will enable the user to modify the image horizontal size and fine tune the image quality.

FREQUENCY: Increase/decrease the image horizontal size.
PHASE: Fine tune the data sampling position (adjust image quality.)

PICTURE TYPE : Motion / Still (Adjustment for best image quality)
If graphics on screen move a lot, select "Motion"
If graphics on screen are mostly still, select "Still"



VIDEO ADJUSTMENT:
Selecting this function will enable the user to modify the color saturation of the picture, tint and sharpness.

COLOR: Increase/decrease video color level.
TINT: Increase/decrease tint level.
SHARPNESS: Increase/decrease video image sharpness level.

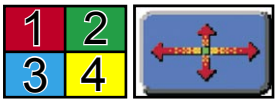
PICTURE TYPE : Motion / Still / Normal (Adjustment for best image quality)
If graphics on screen move a lot, select "Motion"
If graphics on screen are mostly still, select "Still"
General motion - non flicker mode, select "Normal"

VIDEO TYPE : Change to best match the source signal. (DVD / VCR)

VIDEO SYSTEM:
Selecting this function will enable the user to select video system and input signals.

AUTO : Automatic detection of NTSC or PAL system. (Not applicable in SECAM)
NTSC / NTSC 4.43 : Manual select NTSC system.
PAL / PAL M : Manual select PAL system.
SECAM : Manual select SECAM system.

STATUS:
Selecting this function will display graphic information such as resolution and frequency.



POSITION: (No function in DVI mode)
Selecting this function will enable the user to position the image within the display area.

IMAGE UP/DOWN : Position the image vertically using “UP” or “DOWN” buttons.
IMAGE LEFT/RIGHT : Position the image horizontally using “+” or “-” buttons.

PICTURE IN PICTURE:
Selecting this function will enable the user to configure PIP window size, input signal source, horizontal and vertical position and more.

PIP SIZE : Select PIP window size. Choose between OFF, SIZE1, SIZE2 or SIZE3.
PIP SOURCE : Select video source to be displayed in PIP window.

Choose between AUTO, COMP, SVID:

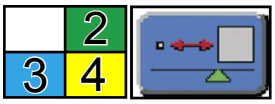
AUTO = automatic detection of Composite, S-Video.
COMP = manual select composite video signal only.
SVID = manual select S-Video signal only.

HORIZONTAL POSITION: Adjust the position of the PIP window horizontally.
VERTICAL POSITION: Adjust the position of the PIP window vertically.

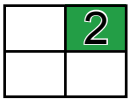
ADVANCED PIP SETTINGS: (Press “+” to access the sub-menu)

BRIGHTNESS: Increase/decrease the image brightness of the PIP window.
CONTRAST: Increase/decrease the image contrast of the PIP window.
SHARPNESS: Increase/decrease the image sharpness of the PIP window.
TINT: Increase/decrease the tint of the image of the PIP window.
COLOR: Increase/decrease the color of the image of the PIP window.

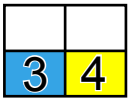
ROTATION:
Selecting this function will enable the user to rotate the image to either landscape or portrait format.



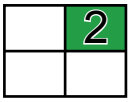
GRAPHIC SCALING MODES:
Selecting this function will enable the user to configure the graphic scaling of the PC or VIDEO image.



Scaling methods in PC/DVI MODE: ONE TO ONE, FILL SCREEN, FILL TO ASPECT RATIO, NONLINEAR SCALING MODES

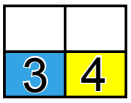


Scaling methods in VIDEO MODE: NORMAL, LETTERBOX, LETTERBOX WITH SUBTITLES, NONLINEAR SCALING MODES



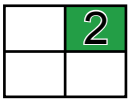
ONE TO ONE: (Press "+" to access the sub-menu)

HORIZONTAL PAN: Increase/decrease the horizontal pan.
VERTICAL PAN: Increase/decrease the vertical pan.

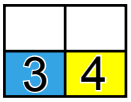


NORMAL: (Press "+" to access the sub-menu)

HORIZONTAL CLIPPING: Increase/decrease the horizontal clipping.
HORIZONTAL OFFSET: Increase/decrease the horizontal offset.
HORIZONTAL STRETCH: Increase/decrease the horizontal stretch.
VERTICAL CLIPPING: Increase/decrease the vertical clipping.
VERTICAL OFFSET: Increase/decrease the vertical offset.
VERTICAL STRETCH: Increase/decrease the vertical stretch.



FILL SCREEN : Enable full screen expansion for lower resolution image.
FILL TO ASPECT RATIO : Enable full screen expansion for lower resolution image according to aspect ratio.



LETTERBOX : Stretches a letterboxed picture to full screen.
LETTERBOX WITH SUBTITLES : Stretches and pans a letterboxed picture to full screen, which enables viewing of subtitles in bottom.

NONLINEAR SCALING MODES: (Press "+" to access the sub-menu)

HORIZONTAL CLIPPING: Increase/decrease the horizontal clipping.
HORIZONTAL OFFSET: Increase/decrease the horizontal offset.
HORIZONTAL STRETCH: Increase/decrease the horizontal stretch.
VERTICAL CLIPPING: Increase/decrease the vertical clipping.
VERTICAL OFFSET: Increase/decrease the vertical offset.
VERTICAL STRETCH: Increase/decrease the vertical stretch.

LANGUAGE:
Available languages are: English, Danish and Simplified Chinese. This will affect all text and messages in the OSD menus.

1 2 3 4

UTILITIES:
Selecting this function will enable the user to configure the OSD menu, define hot keys, verify BIOS Firmware version and miscellaneous operations.

2 4 **USER SETTING:** (Press "+" to access the sub-menu)

DPMS	: Disable / Enable the DPMS function.
DISPLAY INPUT	: Disable / Enable input source name upon power up.
AUTO SOURCE SELECT	: Off = Disable auto source select function. Low = Auto source select enabled ONLY in power up. High = Auto source select ALWAYS enabled.
GAMMA	: 1.0 / 1.6 / 2.2 - Adjusts gamma on TFT display.

1 2 3 4 **OSD SETTING:** (Press "+" to access the sub-menu)

OSD H-POSITION: Position the OSD menu horizontally.
OSD V-POSITION: Position the OSD menu vertically.

OSD BACKGROUND	: Choose between Translucent or Opaque.
OSD MENU ROTATE	: Choose between Normal / Rotate. Will position the menu either horizontally or vertically.
USER TIME OUT	: Adjust the OSD menu time out period in a step of 5 seconds.

2 4 **FREEZE** : Press "+" to freeze the display area, including PIP view.

2 4 **ZOOM:** (Press "+" to access the sub-menu)

ZOOM LEVEL: Zooms in the display area from center.
HORIZONTAL PAN: Pan the display area horizontally.
VERTICAL PAN: Pan the display area vertically.

1 2 3 4 **DIRECT ACCESS 1 & 2:** (Press "+" to access the sub-menu)
Define the hot key function ("+" or "-" front/under hatch buttons) to one of these OSD functions:
Brightness / Contrast / Volume / Freeze / Zoom / Video Source / PIP * / No Function / Test Pattern
** By pressing the assigned hot key, the sequence of the selected input video source are:*
Analog RGB / Component / Video / Composite Video / S-Video. (Note: Component Video is not implemented)

NOTE: *Direct Access 1 default setting is VOLUME*
NOTE: *Direct Access 2 default setting is NO FUNCTION*

2 4 **DISPLAY ORIENTATION:** (Press "+" to access the sub-menu)
Will flip/inverse the display area including PIP view. Press "+" to choose between:
Normal / Horizontal Inverse / Vertical Inverse / Inverse

1 2 **CALIBRATE RGB GAIN** : Color Calibration. Press "+" to automatically adjust it.

1 2 3 4 **LOAD (FACTORY) DEFAULTS:** (Press "+" to access the sub-menu. **NOTE: Only on newer models**)

LOAD USER DEFAULT	: Load your own personal custom settings.
SAVE USER DEFAULT	: Save your own personal custom settings.
LOAD FACTORY DEFAULT	: Will reset the VGA controller settings to the factory preset. Use caution when using this function, as this will override your current settings. (Does not affect USER DEFAULTS)

TEST PATTERN : Shows a generic test pattern.

VIDEO SOURCE:
Selecting this function will enable the user to select the type of input signal to show fullscreen. Available inputs are: Analog RGB, Component Video*, Composite Video, S-Video and DVI. *(*Component Video is not implemented in our products.)*
Pressing "+" will activate the input, and pressing "-" will detect automatically.

VOLUME:
This function is not implemented in displays, and have no operational effect.

EXIT MENU:
Selecting this function will exit the OSD menu.
Press "+" to exit and save the current settings.

Note:
The OSD settings will also automatically be stored in memory when the OSD exit on user timeout.

Specifications

Specifications - JH 19T01 MIL

Note: All specifications are subject to change without prior notice!

TECHNICAL DESCRIPTION:

TFT Technology:
- 19.0 inch viewable image size
- Active Matrix, Thin Film Transistor (TFT)
- MVA Premium™ technology

TFT Characteristics:
- Pixel number : 1280 x 1024
- Pixel pitch (RGB) : 0.294 (H) x 0.294 (V) mm
- Response Time : 15 ms (typical), "black" to "white"
- Contrast Ratio : 600:1 (typical)
- Light Intensity : 250 cd/m2 (typical)
- Viewable Angle : +/- 85 deg. (typical) (Up/Down/Left/Right)
- Active Display Area : 376.32 (H) x 301.056 (V) mm
- Max Colors : 16.7 millions (depending on graphics card)
- Video Signal : Analog RGB 0,7Vp-p
  : Input Impedance 75 Ohm

Synchronisation:
- Digital separate synchronisation
- Composite synchronisation
- Synchronisation on green
- Auto detects VGA -> SXGA, interlaced and non interlaced
- Horizontal : 31,5 kHz to 91,1 kHz
- Vertical : 60 Hz * to 85 Hz

Resolutions:
- VGA : 640 x 480 (including 640 x 350)
- SVGA : 800 x 600 (including 720 x 400)
- XGA : 1024 x 768
- SXGA : 1280 x 1024 *

** Recommended for optimum picture quality*

Video Signals:
- Composite video (Interlaced NTSC and PAL/SECAM video)

Power Supply Options / Consumption:
- 115VAC/60Hz & 230VAC/50Hz : Model JH 19T01 MIL A1
- 24 VDC : Model JH 19T01 MIL A2
- Operating : 100 W (max)

EXTENDED TESTING (In addition to IEC 60945):

TEST	LEVEL	SPECIFICATION
Dry heat storage	70°	IEC 60068-2-2 (1974), Test Bd
Cold storage	-40°	IEC 60068-2-1 (1990), Test Ad
Resonance search	4-33 Hz @ 2g No resonance above 2	IEC 60068-2-6 (1995), Test Fc
Endurance Vibration	4-33 Hz @ +/-5mm, 2g	IEC 60068-2-6 (1995), Test Fc
Shock	50g / 11ms	IEC 60068-2-27 (1987), Test Ea
Transient Shock	2-280 Hz Designed to envelope a half sine shock pulse of 50g / 35ms	IEC 60068-2-57 (1999-11), Test Ff
Rain (drip proof)	-	MIL-STD-810F *
Salt Fog	-	MIL-STD-810F *

** Console mounted.*

MECHANICAL DESCRIPTION:

Physical Dimensions:
- 483 (W) x 444 (H) 68 (D)
- Weight: 14 kg (approx)

Input Signal Terminal:
- RGB (PC) signal : 5 x BNC Connectors (RGBHV)
- Composite Video : 1 x BNC Connector
- AC Power signal : Std IEC Inlet - Model JH 19T01 MIL A1
- DC Power signal : Screw Terminal - Model JH 19T01 MIL A2

Accessories:
- Touchscreen : 1 x D-SUB 9P Connector (female)
- Remote Control : 2 x D-SUB 9P Connectors (female)

User Controls / On front bezel:
- Power On/Off (push button)
- Brightness Control
- 2 x hotkeys
- Mode Status LED

User Controls / Behind hatch:
- On Screen Display control (OSD/OSM)

Environmental Considerations:
- Operating : Temperature -15 deg. C to +55 deg. C
  Humidity 30% to 90% (non condensing)
- Storage : Temperature -40 deg. C to +70 deg. C
  Humidity 10% to 90% (non condensing)

Available Accessories:
- JH MMD BR = Bracket *
- JH MMDRO = Rotary Bracket *
- JH 19TSV = Sun Visor *
- JH VESA 18T04 = Vesa Bracket *
- Touch Screen **

** Option: Standard or custom logo and color*
*** Option: Factory mounted*

EMI TESTING:

The unit is tested according to the following:

MIL-STD 461E, 1999
MIL-STD 462E, 1999

- CE 101 - Conducted emission, 30 Hz - 10 kHz
- CE 102 - Conducted emissions, 10 kHz - 10 Mhz
- CS 101 - Conducted susceptibility, 30 Hz - 50 kHz
- CS 114 - Conducted susceptibility, 10 kHz - 200 MHz
- CS 116 - Conducted susceptibility, damped oscillatory waves
- RE 101 - Radiated emission, H-field, 30 Hz - 100 kHz
- RE 102 - Radiated emissions, E-field, 10 kHz - 10 GHz
- RS 101 - Radiated susceptibility, H-field, 30 Hz - 100 kHz
- RS 103 - Radiated susceptibility, E-field, 2 MHz - 18 GHz

Other:

- Transient immunity, 100 ns risetime, 10 µs duration, 325 V_{PEAK}
- Supply voltage variation test, 98 -> 276 VAC, 47 -> 63.6 Hz
- Measurements of power consumption = 42W
- Measurements of inrush current = 4 A_{PEAK}

Specifications - JH 20T03 MIL

Note: All specifications are subject to change without prior notice!

TECHNICAL DESCRIPTION:

TFT Technology:
- 20.1" viewable image size
- Active Matrix, Thin Film Transistor (TFT)

TFT Characteristics:
- Pixel Number : 1280 x 1024
- Pixel Pitch (RGB) : 0.312 (H) x 0.312 (V) mm
- Response Time : 25 ms (typical), "black" to "white"
- Contrast Ratio : 300:1 (typical)
- Light Intensity : 250 cd/m2 (typical)
- Viewable Angle : +/- 85 deg. (typical) (Up/Down/Left/Right)
- Active Display Area : 399.36 (H) x 319.49 (V) mm
- Max Colors : 16.7 millions (depending on graphics card)

Synchronisation:
- Digital separate synchronisation
- Composite synchronisation
- Synchronisation on green
- Auto detects VGA -> SXGA, interlaced and non interlaced
- Video Signal : Analog RGB 0,7Vp-p
  : Input Impedance 75 Ohm
- Horizontal : 31,5 kHz to 91,1 kHz
- Vertical : 60 Hz * to 85 Hz

Resolutions:
- VGA : 640 x 480 (including 640 x 350)
- SVGA : 800 x 600 (including 720 x 400)
- XGA : 1024 x 768
- SXGA : 1280 x 1024 *

** Recommended for optimum picture quality*

Power Supply Options / Consumption:
- 115VAC/60Hz & 230VAC/50Hz : Model JH 20T03 MIL E1
- Operating : 100 W (max)

EXTENDED TESTING (In addition to IEC 60945):

TEST	LEVEL	SPECIFICATION
Dry heat storage	70°	IEC 60068-2-2 (1974), Test Bd
Cold storage	-40°	IEC 60068-2-1 (1990), Test Ad
Resonance search	4-33 Hz @ 2g No resonance above 2	IEC 60068-2-6 (1995), Test Fc
Endurance Vibration	4-33 Hz @ +/-5mm, 2g	IEC 60068-2-6 (1995), Test Fc
Shock	50g / 11ms	IEC 60068-2-27 (1987), Test Ea
Transient Shock	2-280 Hz Designed to envelope sine shock pulse of 50g / 35ms	IEC 60068-2-57 (1999-11), Test Ff
Rain (drip proof)	280 l/m^2/hour 15min pr. orientation	MIL-STD-810F *
Salt Fog	-	MIL-STD-810F *

** Console mounted.*

MECHANICAL DESCRIPTION:

Physical Dimensions:
- 534 (W) x 485 (H) 79.50 (D)
- Weight: 14 kg (approx)

Input Signal Terminal:
- RGB (PC) signal : 5 x BNC Connectors (RGBHV)
- AC Power signal : Std IEC Inlet - Model JH 20T03 MIL E1

Accessories:
- Touchscreen : 1 x D-SUB 9P Connector (female)
- Remote Control : 2 x D-SUB 9P Connectors (female)

User Controls / On front bezel:
- Power On/Off (push button), Brightness Control, 2 x hotkeys, Mode Status LED

User Controls / Behind hatch:
- On Screen Display control (OSD/OSM)

Environmental Considerations:
- Operating : Temperature -15 deg. C to +55 deg. C
  Humidity 30% to 90% (non condensing)
- Storage : Temperature -40 deg. C to +70 deg. C
  Humidity 10% to 90% (non condensing)

Available Accessories:
- JH MMD BR = Bracket *
- JH MMDRO = Rotary Bracket *
- JH 20TSV = Sun Visor *
- JH VESA 20T03 = Vesa Bracket *
- Touch Screen **

** Option: Standard or custom logo and color*
*** Option: Factory mounted*

EMI TESTING:

The unit has been tested according to the following:

MIL-STD 461D, 1993
MIL-STD 462D, 1993

- CE 101 - Conducted emission, 30 Hz - 10 kHz
- CE 102 - Conducted emissions, power leads, 10 kHz - 10 Mhz
- CS 101 - Conducted susceptibility, 30 Hz - 50 kHz
- CS 114 - Conducted susceptibility, 10 kHz - 200 MHz
- CS 116 - Conducted susceptibility, damped oscillatory waves
- RE 101 - Radiated emission, magnetic field, 30 Hz - 100 kHz
- RE 102 - Radiated emissions, electric field, 10 kHz - 18 GHz
- RS 101 - Radiated susceptibility, H-field, 30 Hz - 100 kHz
- RS 103 - Radiated susceptibility, electric field, 2 MHz - 18 GHz

Other:

- Transient immunity, 100 ns risetime, 10 µs duration, 325 V_{PEAK}
- Supply voltage variation test, 98 -> 138 VAC, 56.4 -> 63.6 Hz
- Measurements of power consumption = 76W
- Measurements of inrush current = 4 A_{PEAK}

Specifications - JH 20T04 MIL

Note: All specifications are subject to change without prior notice!

TECHNICAL DESCRIPTION:

TFT Technology:
- 20.1" viewable image size
- Active Matrix, Thin Film Transistor (TFT)
- MVA Premium™ technology

TFT Characteristics:
- Pixel number : 1600 x 1200
- Pixel pitch (RGB) : 0.255 (H) x 0.255 (V) mm
- Response Time : 15 ms (typical), "black" to "white"
- Contrast Ratio : 600:1 (typical)
- Light Intensity : 250 cd/m2 (typical)
- Viewable Angle : +/- 85 deg. (typical) (Up/Down/Left/Right)
- Active Display Area : 408.0 (H) x 306.0 (V) mm
- Max Colors : 16.7 millions (depending on graphics card)

Synchronisation:
- Digital separate synchronisation
- Composite synchronisation
- Synchronisation on green
- Auto detects VGA -> UXGA, interlaced and non interlaced
- Video Signal : Analog RGB 0,7Vp-p
  : Input Impedance 75 Ohm
- Horizontal : 31.469 kHz to 75 kHz
- Vertical : 56 Hz* to 75 Hz

Resolutions:
- VGA : 640 x 480 (including 640 x 350)
- SVGA : 800 x 600 (including 720 x 400)
- XGA : 1024 x 768
- SXGA : 1280 x 1024
- UXGA : 1600 x 1200 *

** Recommended 60Hz for optimum picture quality. 56 Hz only in 800x600*

Video Signals:
- Composite video (Interlaced NTSC and PAL/SECAM video)

Power Supply Options / Consumption:
- 115VAC/60Hz & 230VAC/50Hz : Model JH 20T04 MIL A1
- 24 VDC : Model JH 20T04 MIL A2
- Operating : 100 W (max)

EXTENDED TESTING (In addition to IEC 60945):

TEST	LEVEL	SPECIFICATION
Dry heat storage	70°	IEC 60068-2-2 (1974), Test Bd
Cold storage	-40°	IEC 60068-2-1 (1990), Test Ad
Resonance search	4-33 Hz @ 2g No resonance above 2	IEC 60068-2-6 (1995), Test Fc
Endurance Vibration	4-33 Hz @ +/-5mm, 2g	IEC 60068-2-6 (1995), Test Fc
Shock	50g / 11ms	IEC 60068-2-27 (1987), Test Ea
Transient Shock	2-280 Hz Designed to envelope a half sine shock pulse of 50g / 35ms	IEC 60068-2-57 (1999-11), Test Ff
Rain (drip proof)	-	MIL-STD-810F *
Salt Fog	-	MIL-STD-810F *

** Console mounted.*

MECHANICAL DESCRIPTION:

Physical Dimensions:
- 534 (W) x 481 (H) 73 (D)
- Weight: 15 kg (approx w/bracket)

Input Signal Terminal:
- RGB (PC) signal : 5 x BNC Connectors (RGBHV)
- Composite Video : 1 x BNC Connector
- AC Power signal : Std IEC Inlet - Model JH 20T04 MIL A1
- DC Power signal : Screw Terminal - Model JH 20T04 MIL A2

Accessories:
- Touchscreen : 1 x D-SUB 9P Connector (female)
- Remote Control : 2 x D-SUB 9P Connectors (female)

User Controls / On front bezel:
- Power On/Off (push button)
- Brightness Control
- 2 x hotkeys
- Mode Status LED

User Controls / Behind hatch:
- On Screen Display control (OSD/OSM)

Environmental Considerations:
- Operating : Temperature -15 deg. C to +55 deg. C
  Humidity 30% to 90% (non condensing)
- Storage : Temperature -40 deg. C to +70 deg. C
  Humidity 10% to 90% (non condensing)

Available Accessories:
- JH MMD BR = Bracket *
- JH MMDRO = Rotary Bracket *
- JH 20TSV = Sun Visor *
- JH VESA 20T03 = Vesa Bracket *
- Touch Screen **

** Option: Standard or custom logo and color*
*** Option: Factory mounted*

EMI TESTING:

The unit is tested according to the following:
MIL-STD 461E, 1999
MIL-STD 462E, 1999
MIL-STD 901D, Shock Test, Hard-mounted

- CE 101 - Conducted emission, 30 Hz - 10 kHz
- CE 102 - Conducted emissions, 10 kHz - 10 Mhz
- CS 101 - Conducted susceptibility, 30 Hz - 50 kHz
- CS 114 - Conducted susceptibility, 10 kHz - 200 MHz
- CS 116 - Conducted susceptibility, damped oscillatory waves
- RE 101 - Radiated emission, H-field, 30 Hz - 100 kHz
- RE 102 - Radiated emissions, E-field, 10 kHz - 10 GHz
- RS 101 - Radiated susceptibility, H-field, 30 Hz - 100 kHz
- RS 103 - Radiated susceptibility, E-field, 2 MHz - 18 GHz

Other:

- Transient immunity, 100 ns risetime, 10 µs duration, 325 V_{PEAK}
- Supply voltage variation test, 98 -> 276 VAC, 47 -> 63.6 Hz
- Measurements of power consumption = 50W
- Measurements of inrush current = 4 A_{PEAK}

Specifications - JH 23T02 MIL

Note: All specifications are subject to change without prior notice!

TECHNICAL DESCRIPTION:

TFT Technology:
- 23.1 inch viewable image size
- Active Matrix, Thin Film Transistor (TFT)
- MVA Premium™ technology

TFT Characteristics:
- Pixel number : 1600 x 1200
- Pixel pitch (RGB) : 0.294 (H) x 0.294 (V) mm
- Response Time : 20 ms (typical), "black" to "white"
- Contrast Ratio : 600:1 (typical)
- Light Intensity : 250 cd/m2 (typical)
- Viewable Angle : +/- 85 deg. (typical) (Up/Down/Left/Right)
- Active Display Area : 470.4 (H) x 352.8 (V) mm
- Max Colors : 16.7 millions (depending on graphics card)

Synchronisation:
- Digital separate synchronisation
- Composite synchronisation
- Synchronisation on green
- Auto detects VGA -> UXGA, interlaced and non interlaced
- Video Signal : Analog RGB 0,7Vp-p
  : Input Impedance 75 Ohm
- Horizontal : 31.469 kHz to 75 kHz
- Vertical : 60 Hz* to 75 Hz

Resolutions:
- VGA : 640 x 480 (including 640 x 350)
- SVGA : 800 x 600 (including 720 x 400)
- XGA : 1024 x 768
- SXGA : 1280 x 1024
- UXGA : 1600 x 1200 *

** Recommended 60Hz for optimum picture quality. 56 Hz only in 800x600*

Video Signals:
- Composite video (Interlaced NTSC and PAL/SECAM video)

Power Supply Options / Consumption:
- 115VAC/60Hz & 230VAC/50Hz : Model JH 23T02 MIL A1
- 24 VDC : Model JH 23T02 MIL A2
- Operating : 100 W (max)

EXTENDED TESTING (In addition to IEC 60945):

TEST	LEVEL	SPECIFICATION
Dry heat storage	70°	IEC 60068-2-2 (1974), Test Bd
Cold storage	-40°	IEC 60068-2-1 (1990), Test Ad
Resonance search	4-33 Hz @ 2g No resonance above 2	IEC 60068-2-6 (1995), Test Fc
Endurance Vibration	4-33 Hz @ +/-5mm, 2g	IEC 60068-2-6 (1995), Test Fc
Shock	50g / 11ms	IEC 60068-2-27 (1987), Test Ea
Transient Shock	2-280 Hz Designed to envelope a half sine shock pulse of 50g / 35ms	IEC 60068-2-57 (1999-11), Test Ff
Rain (drip proof)	-	MIL-STD-810F *
Salt Fog	-	MIL-STD-810F *

** Console mounted.*

MECHANICAL DESCRIPTION:

Physical Dimensions:
- 584 (W) x 534 (H) 72 (D)
- Weight: 17 kg (approx, with bracket)

Input Signal Terminal:
- RGB (PC) signal : 5 x BNC Connectors (RGBHV)
- Composite Video : 1 x BNC Connector
- AC Power signal : Std IEC Inlet - Model JH 23T02 MIL A1
- DC Power signal : Screw Terminal - Model JH 23T02 MIL A2

Accessories:
- Touchscreen : 1 x D-SUB 9P Connector (female)
- Remote Control : 2 x D-SUB 9P Connectors (female)

User Controls / On front bezel:
- Power On/Off (push button)
- Brightness Control
- 2 x hotkeys
- Mode Status LED

User Controls / Behind hatch:
- On Screen Display control (OSD/OSM)

Environmental Considerations:
- Operating : Temperature -15 deg. C to +55 deg. C
  Humidity 30% to 90% (non condensing)
- Storage : Temperature -40 deg. C to +70 deg. C
  Humidity 10% to 90% (non condensing)

Available Accessories:
- JH MMD BR = Bracket *
- JH MMDRO = Rotary Bracket *
- JH 23TSV = Sun Visor *
- JH VESA 23T01 = Vesa Bracket *
- Touch Screen **

** Option: Standard or custom logo and color*
*** Option: Factory mounted*

EMI TESTING:

The unit is tested according to the following:

MIL-STD 461E, 1999
MIL-STD 462E, 1999

- CE 101 - Conducted emission, 30 Hz - 10 kHz
- CE 102 - Conducted emissions, 10 kHz - 10 Mhz
- CS 101 - Conducted susceptibility, 30 Hz - 50 kHz
- CS 114 - Conducted susceptibility, 10 kHz - 200 MHz
- CS 116 - Conducted susceptibility, damped oscillatory waves
- RE 101 - Radiated emission, H-field, 30 Hz - 100 kHz
- RE 102 - Radiated emissions, E-field, 10 kHz - 10 GHz
- RS 101 - Radiated susceptibility, H-field, 30 Hz - 100 kHz
- RS 103 - Radiated susceptibility, E-field, 2 MHz - 18 GHz

Other:

- Transient immunity, 100 ns risetime, 10 µs duration, 325 V_{PEAK}
- Supply voltage variation test, 98 -> 276 VAC, 47 -> 63.6 Hz
- Measurements of power consumption = TBD
- Measurements of inrush current = 4 A_{PEAK}

Technical Drawings
Main Products

Due to dimensions without decimals, the tolerance on drawings is +/- 1mm (For accurate measurements, measure in AutoCAD)
Technical drawings (.DWG format) are found on our internet site: http://www.hatteland.com

Standard Version

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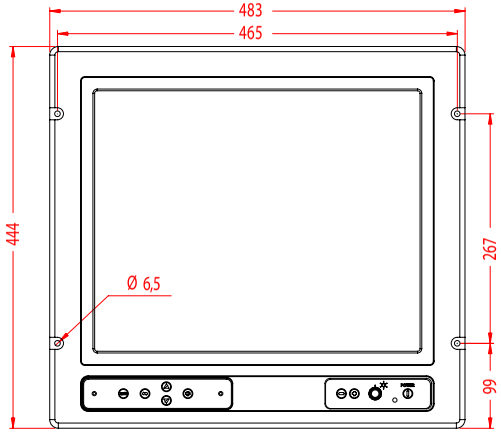
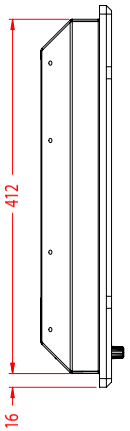
IND100132-39 Rev 1

Technical Drawings - JH 19T01 MIL

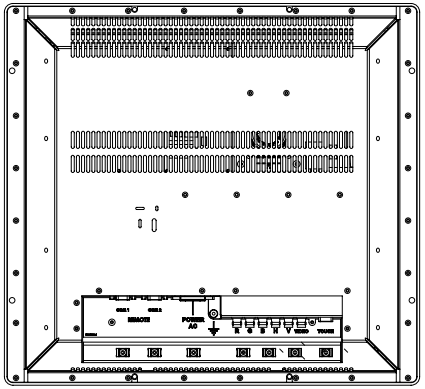
FRONT VIEW



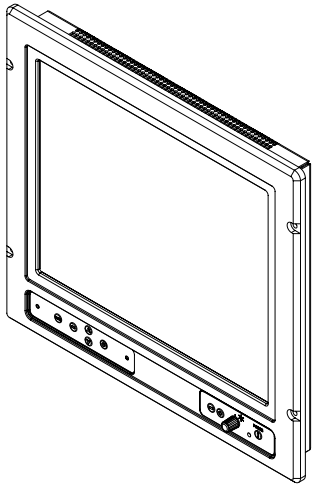
SIDE VIEW



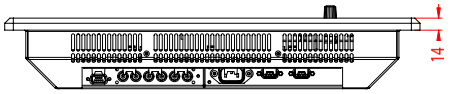
BACK VIEW



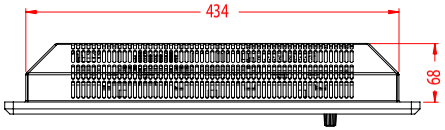
ISOMETRIC VIEW

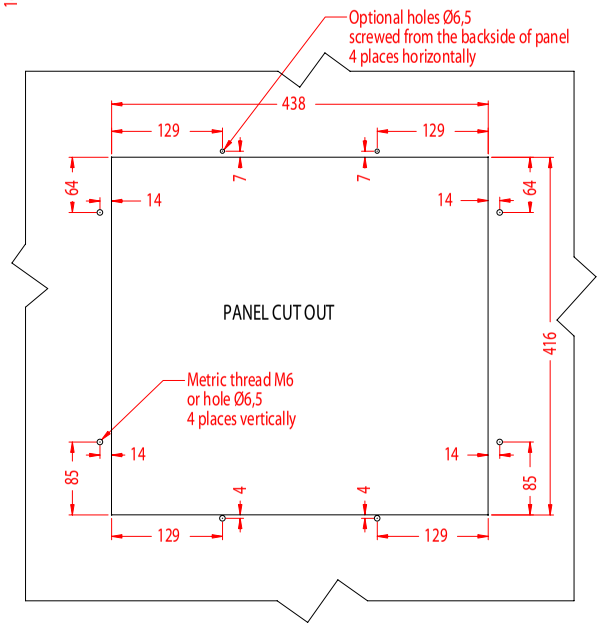


BOTTOM VIEW



TOP VIEW





JH19T01MIL-E1

Date:	Mechanical Designer	Projection	Size: A2 Format Scale:	
21-01-2003	3121		1:4	
Jakob Hatteland Display AS Åmsosen N-5578 Nedre Vats			Approved by: --	Revision:
			Drawing number: A000270-1	

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Technical drawings (.DWG format) are found on our internet site: http://www.hatteland.com

Standard Version

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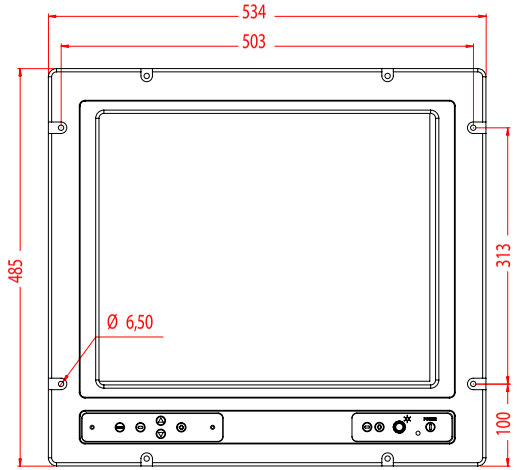
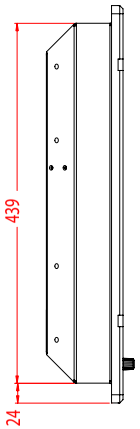
IND100132-40 Rev 1

Technical Drawings - JH 20T03 MIL

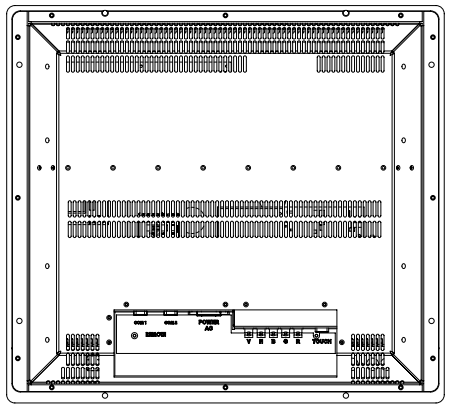
FRONT VIEW



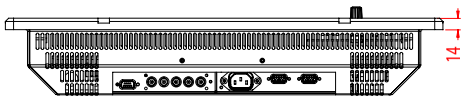
SIDE VIEW



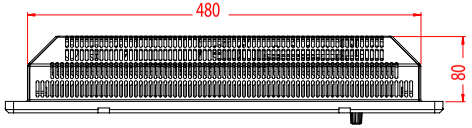
BACK VIEW



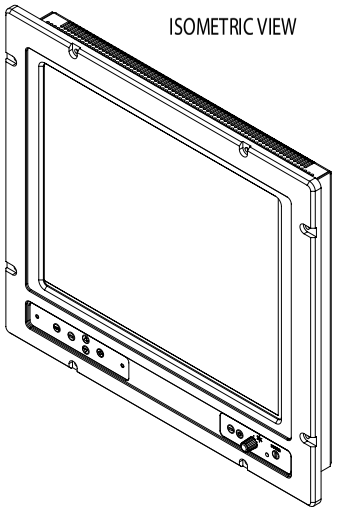
BOTTOM VIEW

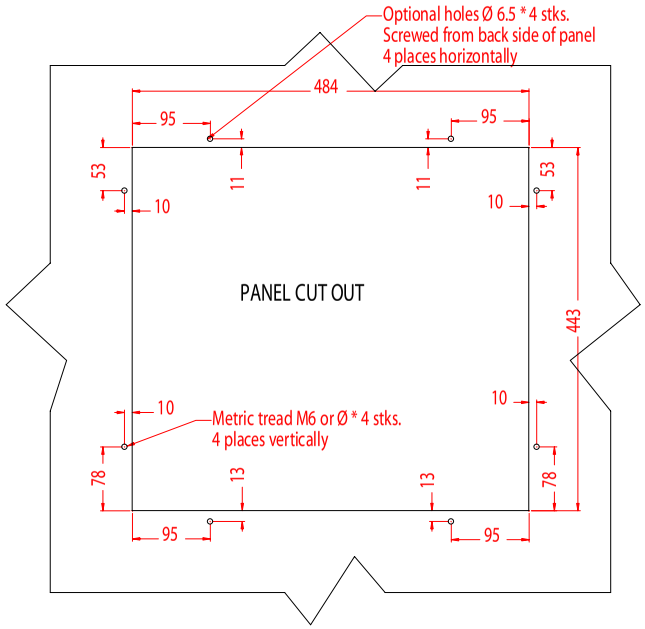


TOP VIEW



ISOMETRIC VIEW





Date	Rev.nr/Tegnet	Projeksjon	Målest. (A1 format)	
22-08-2001	3731		1:3	
Jakob Hatteland Display Åmsosen N-5578 Nedre Vats				JH20T03MIL-E1
10	11			12

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Technical drawings (.DWG format) are found on our internet site: http://www.hatteland.com

Standard Version

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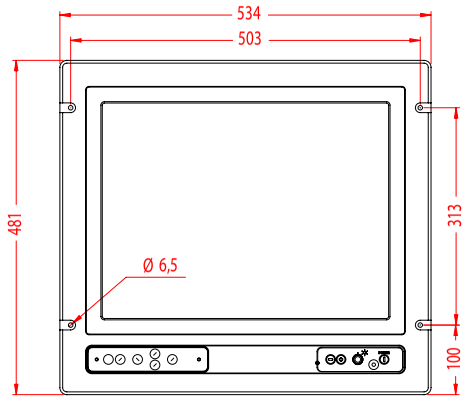
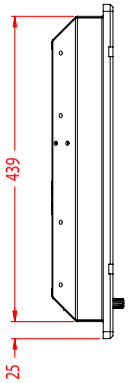
IND100132-41 Rev 1

Technical Drawings - JH 20T04 MIL

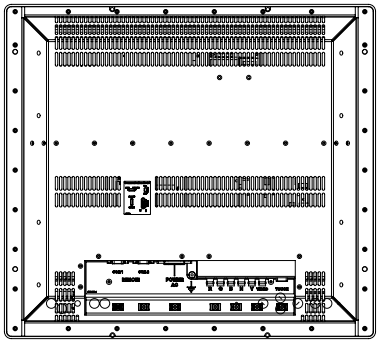
FRONT VIEW



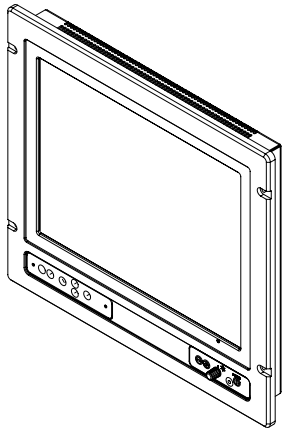
SIDE VIEW



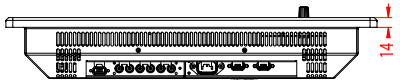
BACK VIEW



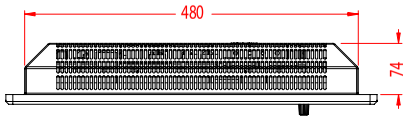
ISOMETRIC VIEW

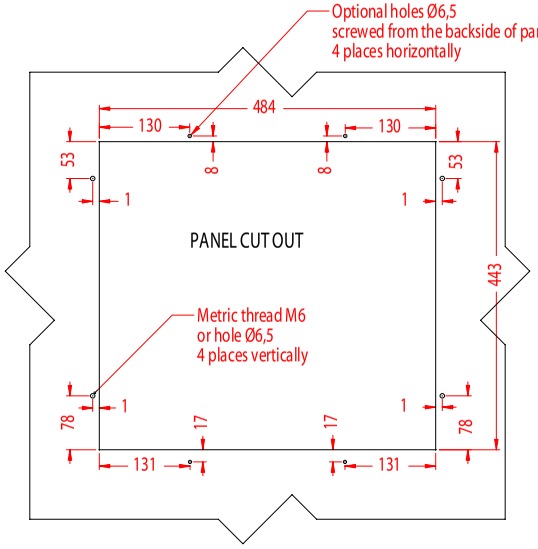


BOTTOM VIEW



TOP VIEW





JH20T04MIL-E1

Date:	Mechanical Designer	Projection	Size: A2 Format Scale:	
23-01-2008	3121		1:5	
Jakob Hatteland Display AS Åmsosen N-5578 Nedre Vats			Approved by: --	Revision:
			Drawing number: A000275-1	

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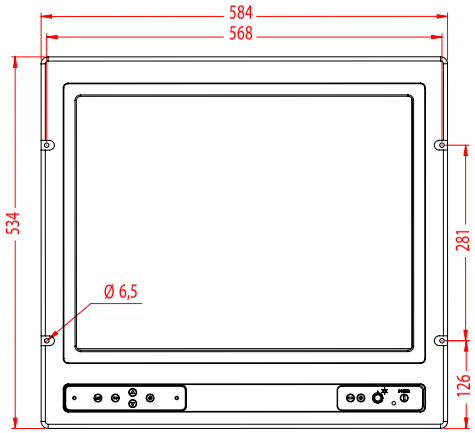
Standard Version

41

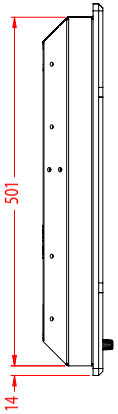
IND100132-42 Rev 1

Technical Drawings - JH 23T02 MIL

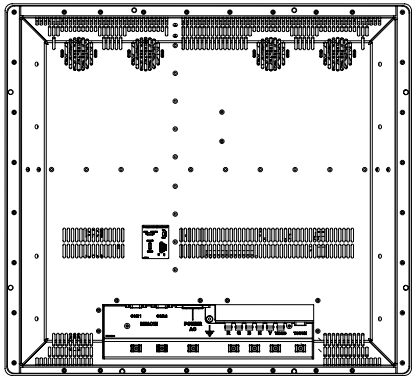
FRONT VIEW



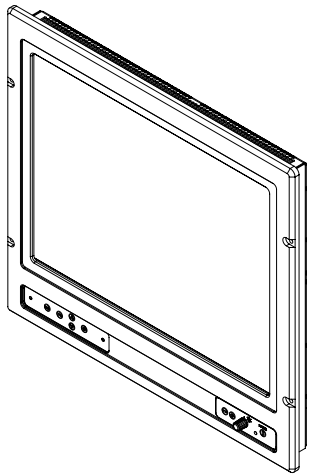
SIDE VIEW



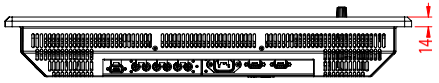
BACK VIEW



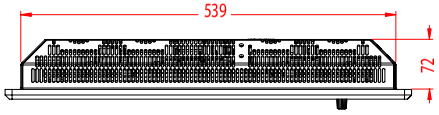
ISOMETRIC VIEW

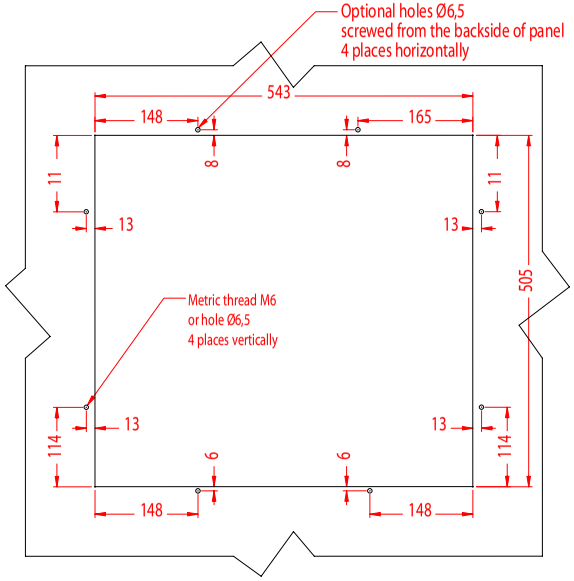


BOTTOM VIEW



TOP VIEW





JH23T02MIL-E1

Date:	Mechanical Designer	Projection	Size: A2 Format Scale:	
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Jakob Hatteland Display AS Åmsosen N-5578 Nedre Vats			Approved by: – Drawing number: A000259-1	Revision:

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Technical Drawings
Accessories

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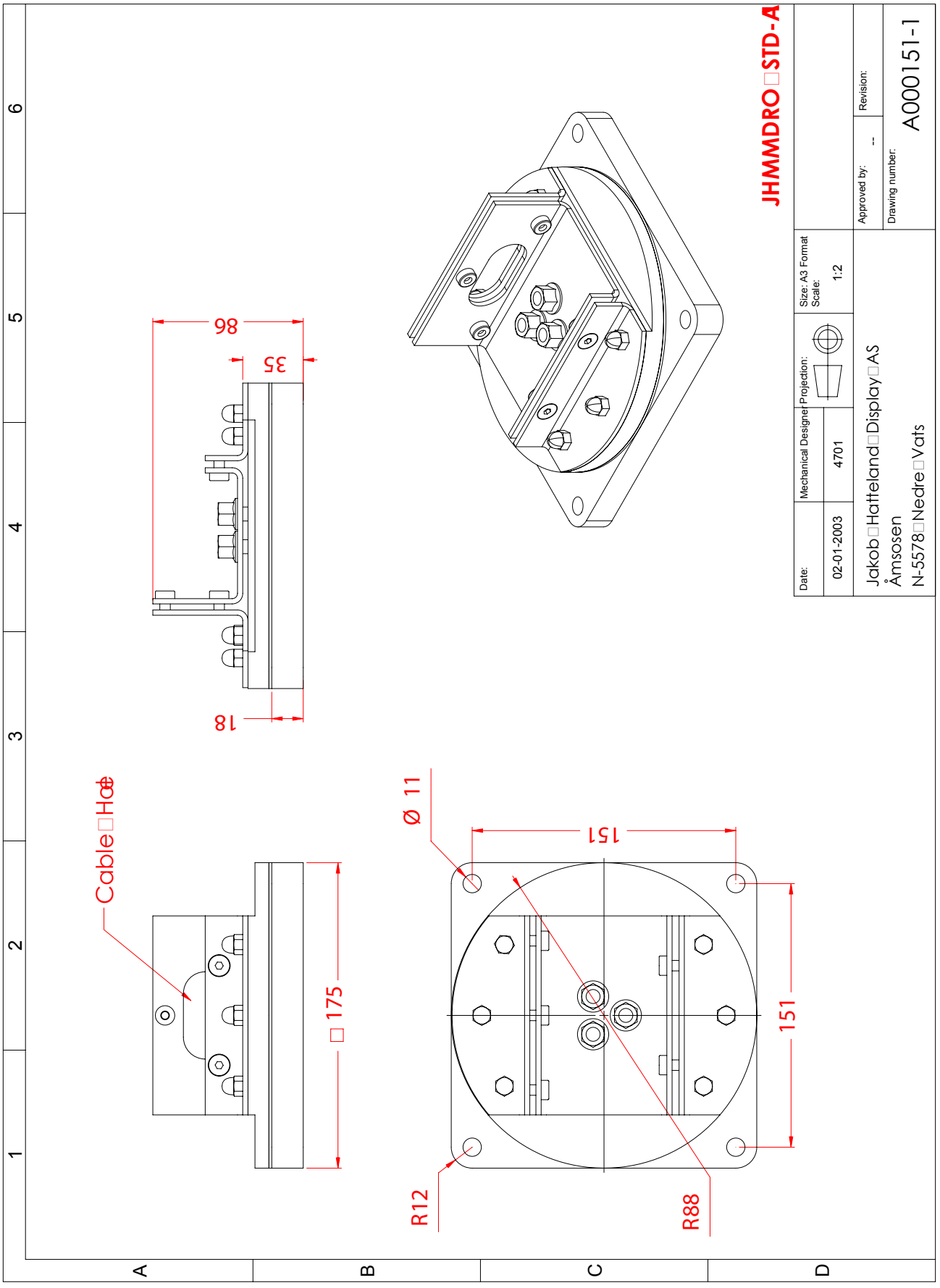

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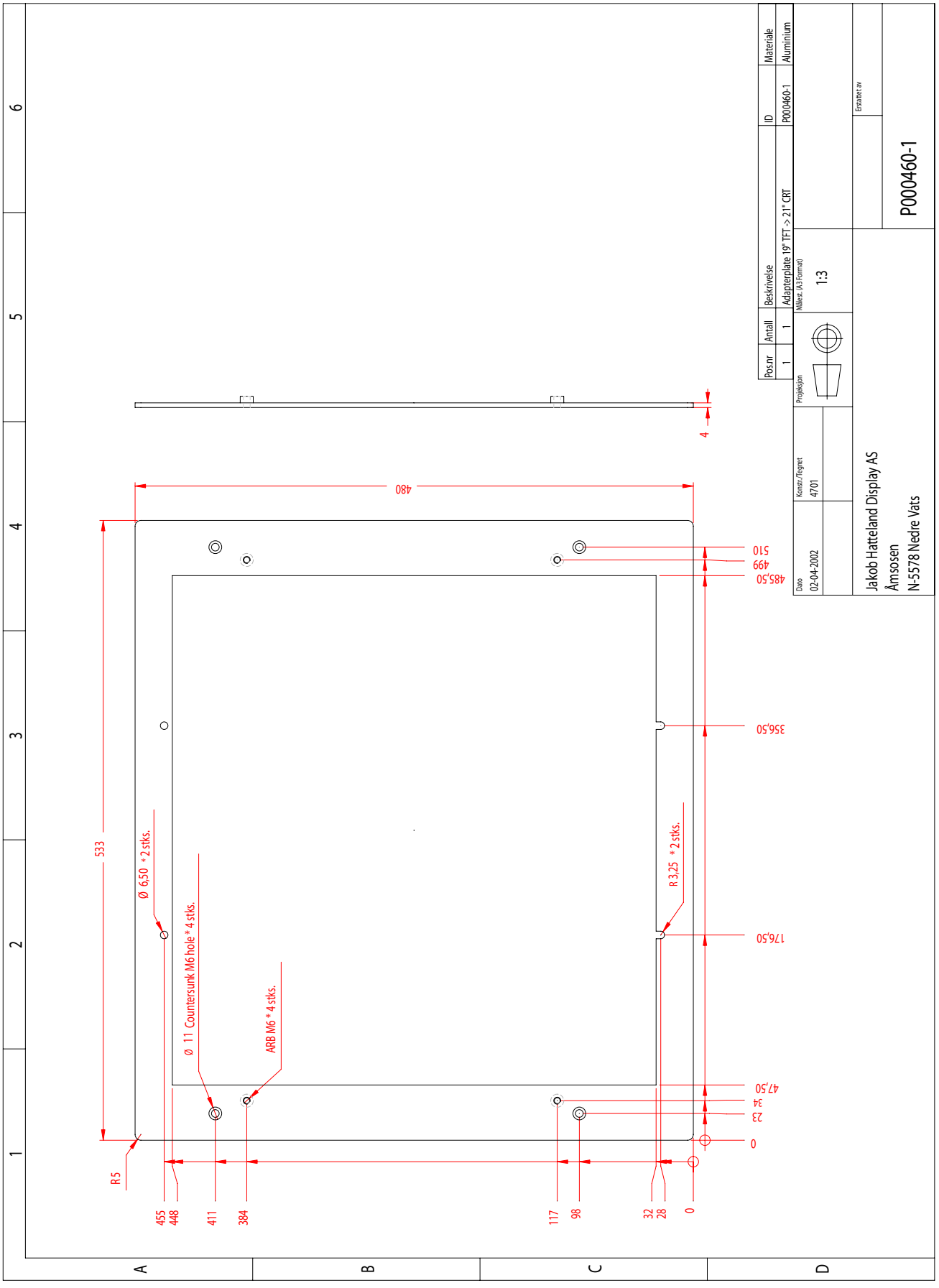

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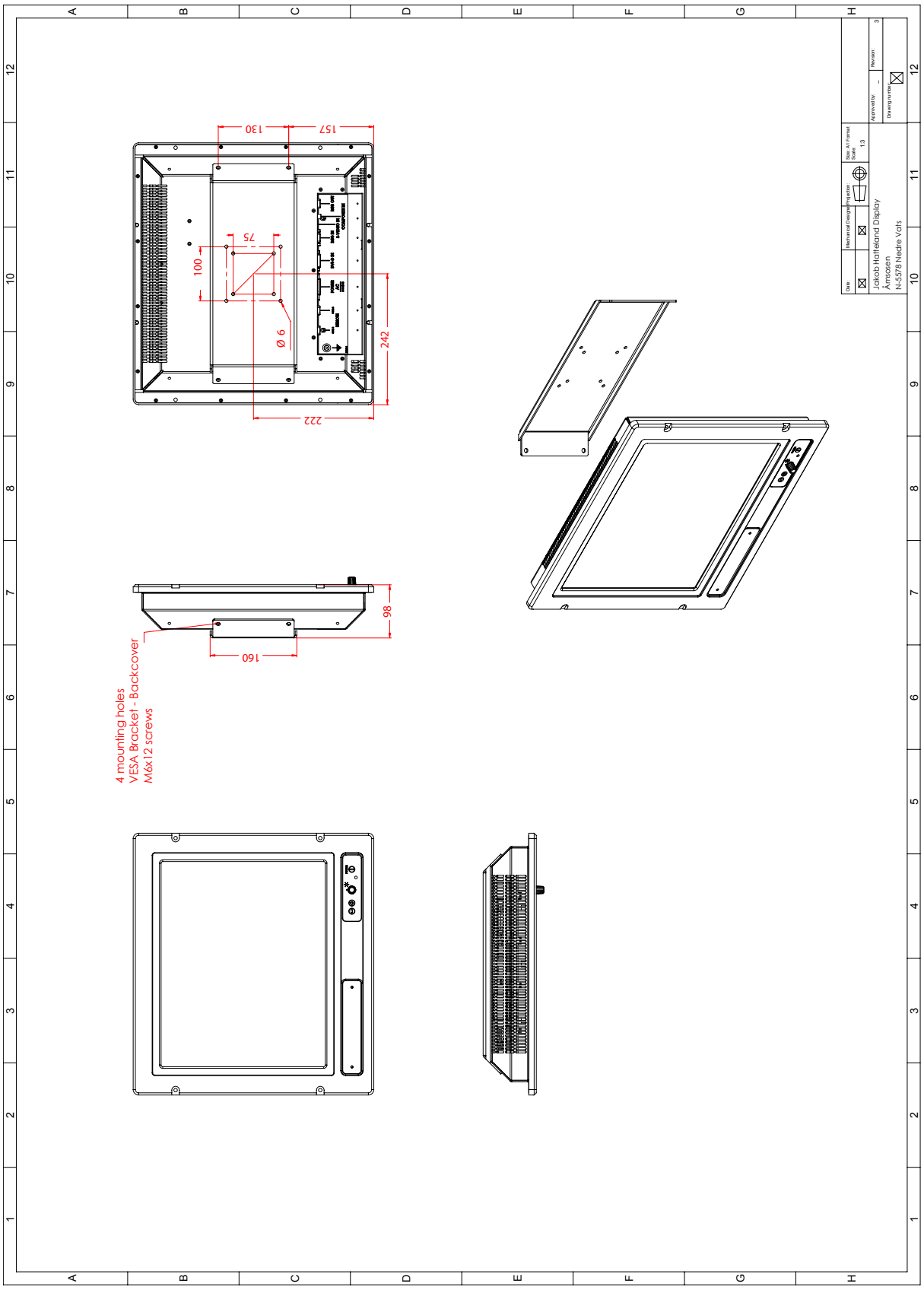
Technical Drawings - Accessories

Shown for 19” inch display. Other sizes available.



Due to dimensions without decimals, the tolerance on drawings is +/- 1mm (For accurate measurements, measure in AutoCAD)
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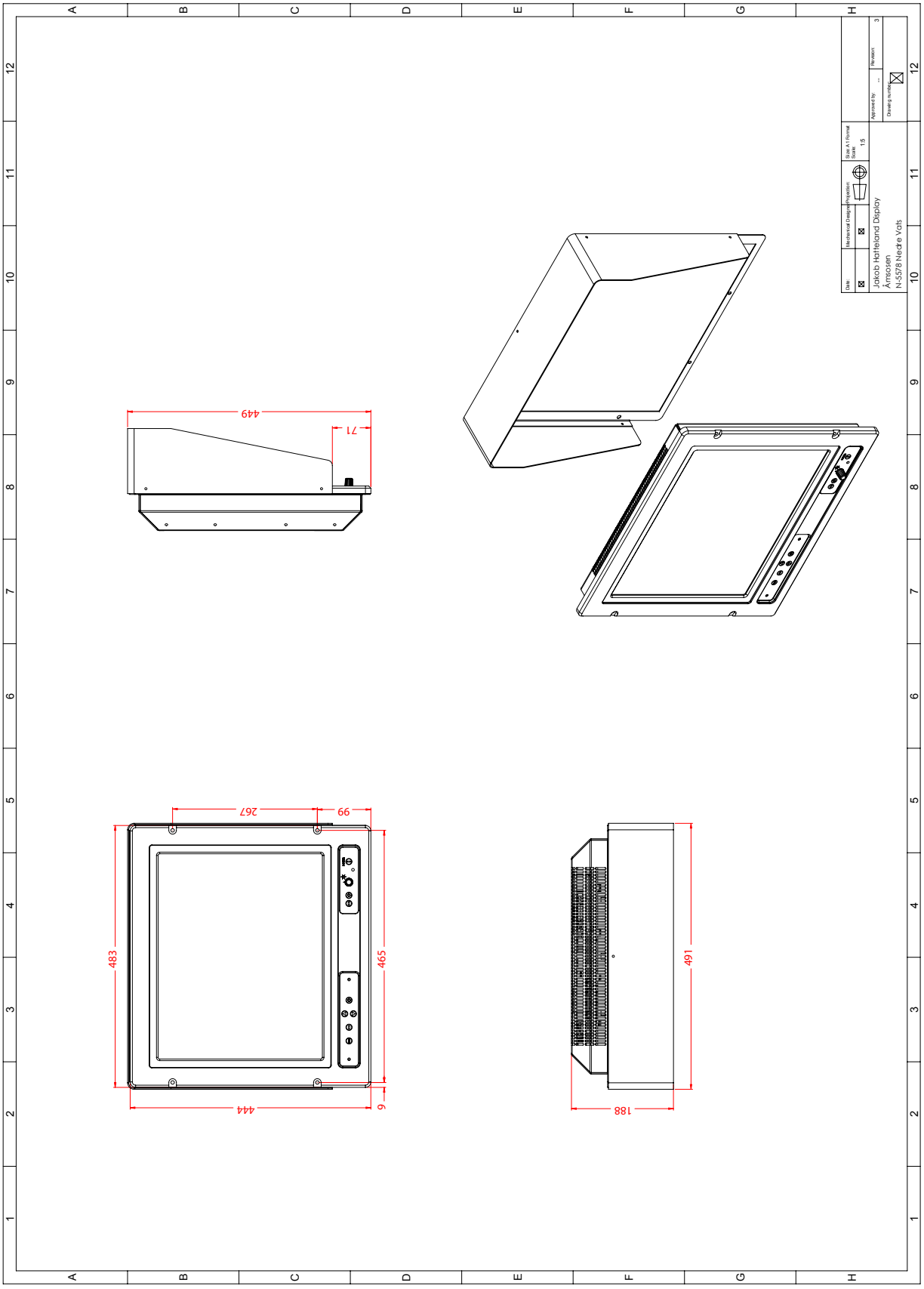
Technical Drawings - Accessories

Shown for 19” inch display. Other sizes available.



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Serial Remote Control Interface

Serial Communication (SCOM) Interface

JH SCOM A1 & C1 Control Interface

This document defines the electrical signals, connectorization, serial data format, and communication protocol of the A1 and C1 version Serial Communication Control Interface. Difference between A1 and C1 is that C1 version provides filtered Dsub contacts for military applications. The purpose of this interface is to provide means for a computer application to control the LCD backlight and menu of one or more displays.

Interface configuration

The serial interface can have different configurations, selected by three switches.
The configurations are defined as follows:

RS 232		One computer controls one Display, no individual address
RS 485	Half duplex	One computer controls max 16 Displays, each with individual address.
	Full duplex	

Brightness Control Operation

The backlight brightness at the Display can be controlled in two modes. A serial interface is used to command the level of backlight brightness and to select mode.

1) Using the local manual brightness control, an operator is only able to adjust brightness to levels lower than the set maximum, including dimming the backlight to extinction.

2) Brightness is independent of local manual brightness control, set by remote control only.

Electrical Interface

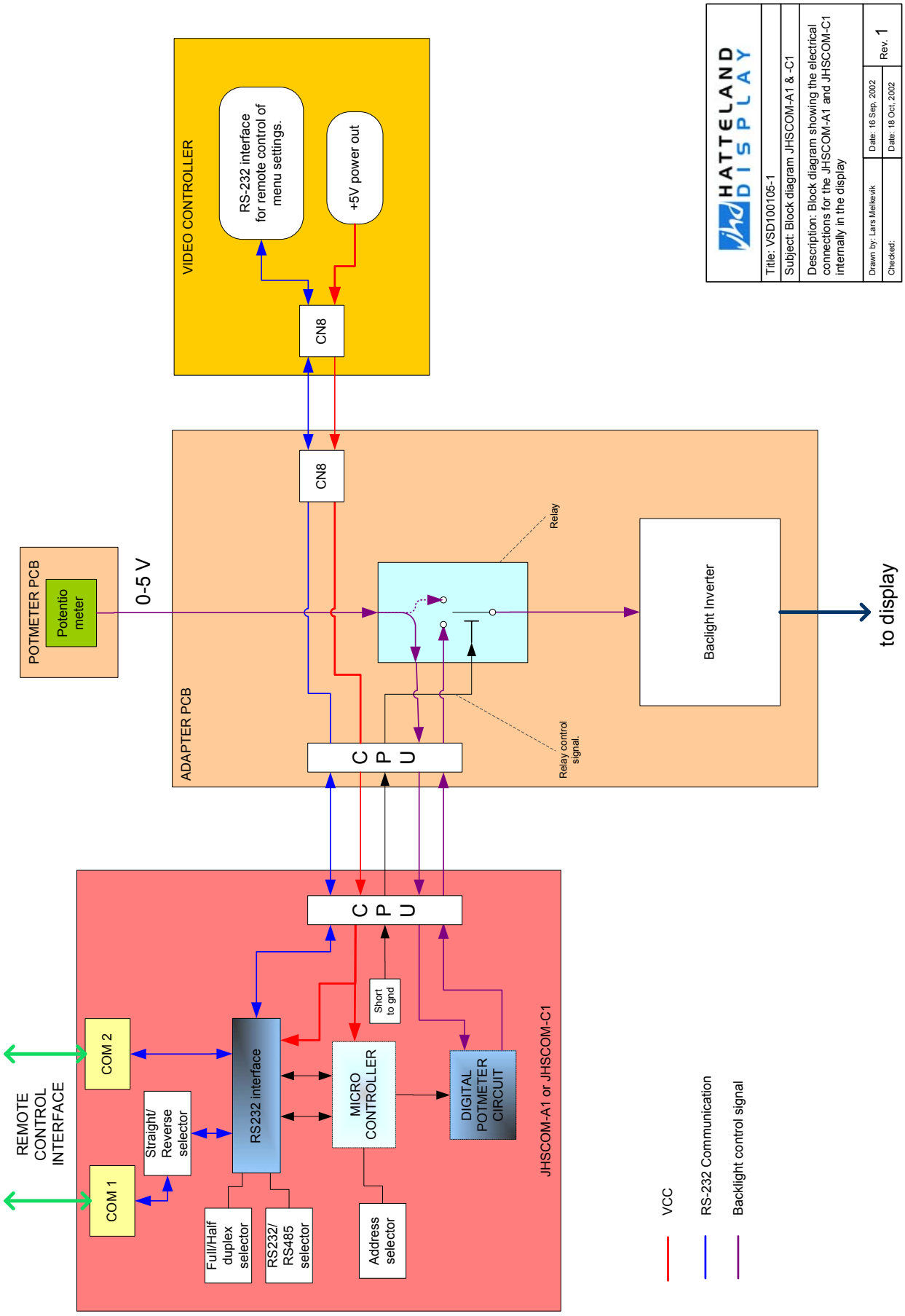
Electrical signals shall conform to RS-485, RS-422 or RS-232. Only Receive Data, Transmit Data, and Signal Ground are used. The same conditions apply for both RS-422 and RS-485, and will just be referred to as RS-485 further on in this document. Hardware handshake is only supported by loopback handshake for RS-232.

Dual 232 and 485 Electrical Interface

Of the two types of electrical interfaces 232 and 485, only one type shall be connected in a given installation, not both. Both receive and transmit capabilities shall be supported. 485 interface supports both half and full duplex. Electrical interface and duplex are selected with switches at the back of the display

Cable

A cable with an overall shield terminated at the back shell should be used.


HATTELAND DISPLAY
Title: VSD100105-1
Subject: Block diagram JHSCOM-A1 & -C1
Description: Block diagram showing the electrical connections for the JHSCOM-A1 and JHSCOM-C1 internally in the display
Drawn by: Lars Melkevik
Date: 16 Sep, 2002
Checked:
Date: 18 Oct, 2002
Rev. 1
VIDEO CONTROLLER
RS-232 interface for remote control of menu settings.
+5V power out
CN8
POTMETER PCB
Potentio meter
0-5 V
ADAPTER PCB
CN8
Relay
Relay control signal.
C P U
Baclight Inverter
to display
C P U
Short to gnd
REMOTE CONTROL INTERFACE
COM 2
COM 1
Straight/ Reverse selector
RS232 interface
MICRO CONTROLLER
DIGITAL POTMETER CIRCUIT
Full/Half duplex selector
RS232/ RS485 selector
Address selector
JHSCOM-A1 or JHSCOM-C1
VCC
RS-232 Communication
Backlight control signal

Connectorization at Display

The display provides two 9 pin D-shell with socket contacts.
Pin assignments at the display are as shown below.

Pin	RS 232	RS422/ RS 485 full duplex	RS 485 half duplex
1	+5V	+5V	+5V
2	Tx	RxD-	-
3	Rx	TxD+	Data +
4	-	GND	GND
5	GND	GND	GND
6	-	GND	GND
7	-	RxD+	-
8	-	TxD-	Data -
9	GND	GND	GND

For full duplex RS-485 , the receive and transmit pins can be altered at COM2. That is: Tx- at pin 2, Rx+ at pin 3, Tx+ at pin 7 and Rx- at pin 8. This can be done to simplify connections, as only one to one cables are needed throughout an installation of several Displays. The alteration is selected by a slide switch on the Remote PCB labelled “one to one” and “rx to tx”.

Data Rate

The display is configured to transmit and receive data at 9600 bits/second.

Data Format

Data shall be transmitted with no parity, 8 data bits, one start bit, and one stop bit.

Message Format

The basic message format shall be as follows:

Byte #	0	1	2,3,4	5	6	7, etc	7+LEN
	ATTN	ADDR	CMD	LEN	IHCHK	DATA	IDCHK

The minimum message size is 7 bytes. The maximum message size is 82 bytes, consistent with 61162-1.

Attention (ATTN)

This byte is used to identify a start of message. It can be one of 3 values:

ATTN	Description	
0x07	Command	(ASCII BELL)
0x06	Acknowledge	(ASCII ACK)
0x15	Negative Acknowledge	(ASCII NAK)

A device shall send a command using the 0x07 Attention Code. The display will respond to the command with either an ACK if the command completed successfully, or a NAK if the command failed.

Address (ADDR)
This byte is used to specify a particular display to receive a Command and to identify the display responding (ACK or NAK) to a Command. All Displays will support the broadcast address.
The display will meet all functional requirements without individual Display addressing.

The Address field shall have the following values:

ADDR	Description
0xFF	Broadcast - Addressed to all displays
0x00 to 0x0F	Address of a specific display (max of 16 Displays)

Command (CMD)
The command shall be one of the following values:

CMD 0	CMD 1	CMD 2	ASCII	Description
0x42	0x52	0x54	“BRT”	Brightness Command
0x4D	0x41	0x4E	“MAN”	Manufacturer ID Code
0x56	0x45	0x52	“VER”	Display ID Version Number
0x50	0x4F	0x54	“POT”	Potentiometer control
0x4D	0x43	0x43	“MCC”	Display Control Command
0x54	0x59	0x50	“TYP”	Type/Model Number Command

These commands shall be as described in Section 2.6.

Data Length (LEN)
This byte defines the length of DATA in the message in bytes. The maximum value for this field shall be 74 bytes. The minimum value is 0 bytes.

Inverse Header Checksum (IHCHK)
This is a simple 8-bit checksum of the header data, message bytes 0 to 5 on which a bit-wise inversion has been performed. The checksum shall be initialised to 0. The 8-bit sum (without carry) of bytes 0, 1, 2, 3, 4, 5 and 6 shall be 0xFF.

To any message that fails the checksum, the receiver shall reply with the attention code set to NAK and no data field. This requirement does not apply to Broadcast messages in RS-485 mode, in which case there will be no reply.

Data Field (DATA)
The DATA field shall only be transmitted if LEN is greater than 0. This field is dependent upon the CMD transmitted.

Inverse Data Checksum (IDCHK)
These bytes shall only be transmitted if LEN is greater than 0. This is a simple 8-bit checksum of the data field, message bytes 7 to 7+(LEN-1) on which a bit-wise inversion has been performed. The checksum shall be initialised to 0. The 8-bit sum (without carry) of bytes 7 through 7+LEN inclusive shall be 0xFF. The receiver will reply to any message that the checksum has failed with the attention code set to NAK. This requirement does not reply to broadcast messages in RS-485 mode, in which case there will be no reply.

Message Commands
The following sections define the message formats for each of the specific commands.

Brightness Command "BRT"
This command shall be sent to the display to command the backlight brightness control setting. The brightness value shall be sent as 1 byte in the DATA field. A setting of 0x00 will indicate off. A setting of 0xFF will indicate maximum brightness. Intermediate values will control brightness over the range from minimum to maximum luminance.

If the data checksum is valid and the brightness was set, the display will reply to this command with an ACK attention code. The DATA field in the reply shall indicate the resulting brightness control setting. If an invalid checksum was received and the message was not Broadcast and RS485, the display will reply with an NAK attention code. The DATA field in the reply will indicate the current brightness control setting.

Examples:
Command 60% Brightness:

0x07	0xFF	0x42	0x52	0x54	0x01	0x10	0x99	0x66

Acknowledge 60% Brightness:

0x06	0xFF	0x42	0x52	0x54	0x01	0x11	0x99	0x66

Negative Acknowledge 40% Brightness:

0x15	0xFF	0x42	0x52	0x54	0x01	0x02	0x66	0x99

Manufacturer ID "MAN"
This command shall be sent to the display to request Manufacturer ID Code. No data shall be sent with this command.
The display will reply to this command with an ACK attention code. The DATA field will be set to an ASCII string value that is unique for each manufacturer.

Examples:
Command Manufacturer ID Code:

0x07	0xFF	0x4D	0x41	0x4E	0x00	0x1D

Acknowledge Manufacturer ID Code "JHD":

0x06	0xFF	0x4D	0x41	0x4E	0x03	0x1B	0x4A	0x48	0x44	0x29

Display ID Model/Version Number "VER"

This command shall be sent to the display in order to identify Display type by preassigned code and, establish the version of the serial communications interface software. No data shall be sent with this command.

Any future revisions, such as additions or changes to the commands or data fields shall be coordinated with a difference in the Display Version Number.
The display will reply to this command with an ACK attention code. The DATA field has a unique 1-byte Display model code. The next 2 bytes shall contain major and minor version of the serial communication protocol in use. Currently the Display Model field is set to 0x01.
The Version Number field for version 1is set to 0x01 0x00.

Examples:
Command Display Model/Version Number:

0x07	0xFF	0x56	0x45	0x52	0x00	0x0C

Display Version 1.0:

0x06	0x05	0x56	0x45	0x52	0x03	0x04	0x01	0x01	0x00	0xFD

Potentiometer control "POT"

As described in 2.1 the LCD Display may allow the backlight to be controlled by the local control (potentiometer) mounted on the front of the display, by the remote control, or by the combination of the two. This command provides means to enable/disable the potentiometer.
LEN = one data byte.

0x00	Disables the potentiometer. Backlight controlled only by the remote control.
0xFF	Enables the potentiometer. Backlight is controlled by both the remote serial interface and the potentiometer. (Default) Note: In this setting, with the BRT command at 100%, the front potentiometer has full control of the backlight. This is the initial setting when a display is powered on.

If the data checksum is valid, the display will reply to this command with an ACK attention code. The DATA field will indicate the resulting control setting. If an invalid data checksum was received and the message was not broadcast and RS485, the display will reply with a NAK attention code and the current control setting.

Display control command "MCC"

This command is used for communication with the video interface controller of the display to allow remote command of the display's setup parameters. The video controller commands are transmitted in the data field. See appendix for complete list of controller commands. Please note that this feature is not supported by all video controllers / displays.

For future products, JHD can not guarantee that all commands will be available.

If the checksum is valid, the display will reply to this command with an ACK attention code, where the data field contains the original command followed by acknowledge from the controller, as described in the appendix. If the checksum is invalid and the message was not broadcast and RS485, the display will reply to this command with a NAK attention code, where the data field contains the original command.

Examples:

Command 50% contrast 0x82 0x41 0x38 0x30:
(50% of 0xFF=0x80. In ASCII 80 will be: 0x38 0x30)

0x07	0xFF	0x4D	0x43	0x43	0x04	0x22

0x82	0x41	0x38	0x30	0xD4

Acknowledge 50% Contrast:

0x06	0x03	0x4D	0x43	0x43	0x06	0x1D

0x82	0x41	0x38	0x30	0x38	0x30	0x6C

Display Type/Model Number "TYP"

This command shall be sent to the display in order to identify the display type by its model number / part number. No data shall be sent with this command.

The display will reply to this command with an ACK attention code. The DATA field will be set to an ASCII string to indicate the specified Type/Model Number, e.g: "JH23T01MMD-A1"

Examples:
Command Type/Model Number

0x07	0xFF	0x54	0x59	0x50	0x00	0xFC

Acknowledge Type/Model Number "JH20T03":

0x06	0xFF	0x54	0x59	0x50	0x07	0x1A

0x4A	0x48	0x32	0x30	0x54	0x30	0x33	0x54

Operational Requirements
The following sections define the operational requirements.

Initial and Default Display Conditions
After any power cycle, the display will start-up with the maximum brightness control range available at the local control and with combined control of the backlight enabled from both the local control (potentiometer) and the remote BRT command. If no serial messages are received, the display will stay in this configuration.

Serial Message Failure
If serial messages stop being transmitted or are corrupt, the display will remain at the last commanded brightness.

Periodic Messages
The Brightness Command shall be transmitted to the display at a repetition no faster than 4 Hz.

Fault Detection and Power Interruption Recovery
To support implementation of keep-alive alarm logic in application software on the computer, the Brightness Command message output from the computer to the display can be repeated once per second, driven by receiving valid acknowledge messages from the display. The keep-alive logic should tolerate intermittent loss of valid acknowledge messages without activating an alarm.

Response Time

Individually Addressed Command Response
The display will output the required response within Tr = 2.5 character periods after the last byte of a command message is received (2.6mS at 9600 bit/sec), except as specified herein.

Broadcast Command Response

In response to RS485 broadcast command messages, after the last byte of the command message is received, all displays will reply within the time period defined for Te, below.
Further more, any gap between these individual responses will be less than the Intermessage Gap, defined below.

Te = (Tr + Lr) * N, where
Lr = length of the ACK/NAK message response
Tr = response time
N = the total number of displays. *

*) As the Displays reply in order to their address, the displays must be given subsequent addresses, starting at zero, for N to equal the total number of Displays. If not, N = the highest display address + 1.

The maximum Lr for each command are shown in the table below:

Command	BRT	MAN	VER	TYP	POT	MCC
Lr	9	13	11	28	9	17

Example: For the BRT command, and 8 displays, this corresponds to

Te = (2.5 * 10 + 9 * 10) * 8 / 9600 = 95.8 ms

MCC Response

For broadcast messages in RS485 mode, the data field of an ACK is limited to 9 bytes, and LEN of command + LEN of ACK is limited to 14. This leads to the response time: 102ms + N * 21ms.

Inter-message Gap

Following an individually addressed command, the next command shall not be issued until at least Tg = 5 character periods after the ACK or NAK message received.
At 9600, that is 5 * 10 / 9600 = 5.2ms.

Following the issue of a broadcast command message, the next command shall not be issued until at least Tc = Te + Tg, where Te is as defined for Broadcast Command response and Tg is defined above.

Display Response and Addresses

When individual display addressing is supported by an installed configuration of displays in a RS485 system, a separate ACK or NAK message for each display will be transmitted providing each display's individual address in response to any broadcast-addressed Command.

NAK messages will not be generated when an error in a Broadcast message is detected.

When individual display addressing is not supported, the display will only respond to the broadcast address and will include the broadcast address in the ACK and NAK messages.
NAK messages will not be generated when an error in a Broadcast message is detected.

When a display receives an incomplete message and the next byte is not received until after a time equal to the Intermessage Gap, the next bytes received shall be processed to check for the start of a new command (0x07, ASCII Bell).

If the header checksum is valid, but the first byte of the command message is not 0x07, as specified, the display may wait until after the next inter-message gap to resume checking.
A NAK message shall not be generated.

If the header checksum is valid, but the value of the CMD field does not equal one of the defined commands, the display shall reply by generating a NAK message as though a VER command had been received.

If the header checksum is valid, but the value of the LEN field is greater than the maximum allowed, the display shall ignore the message. A NAK message shall not be generated.

If the data checksum is valid, but the value in the DATA field associated with a command is invalid (out of range, undefined, etc.), the Display shall generate a NAK message indicating the current data value in the DATA field.

Additional Commands
In time, additional commands and corresponding data fields may be defined. These additions will not conflict with the operation of the interface as defined herein.

Installation in display

Connectorization

The remote control has two 9 pin D-subs for communication. For systems with more than one display, the displays are connected together through the unoccupied D-sub. It is regardless which one is used, with exception for the case described in 2.2.1.2, where COM-1 is connected to another display, and COM-2 is connected to the pc.

Mounting

For mounting of the Remote Control board in a Display, please see “AM040REM - Assembly manual for Remote Control.”

Address

A display’s address is set by a 5-bit dipswitch (red) on the backside of the display, just above the two D-subs. Only bits 1-4 are currently in use. The position of bit 5 has no effect.
Address is adjusted according to the following table:

Address	**Bit 1**	**Bit 2**	**Bit 3**	**Bit 4**
0	Off	Off	Off	Off
1	On	Off	Off	Off
2	Off	On	Off	Off
3	On	On	Off	Off
4	Off	Off	On	Off
5	On	Off	On	Off
6	Off	On	On	Off
7	On	On	On	Off
8	Off	Off	Off	On
9	On	Off	Off	On
10	Off	On	Off	On
11	On	On	Off	On
12	Off	Off	On	On
13	On	Off	On	On
14	Off	On	On	On
15	On	On	On	On

See next chapter for how to set the switches.

Selecting communication mode:

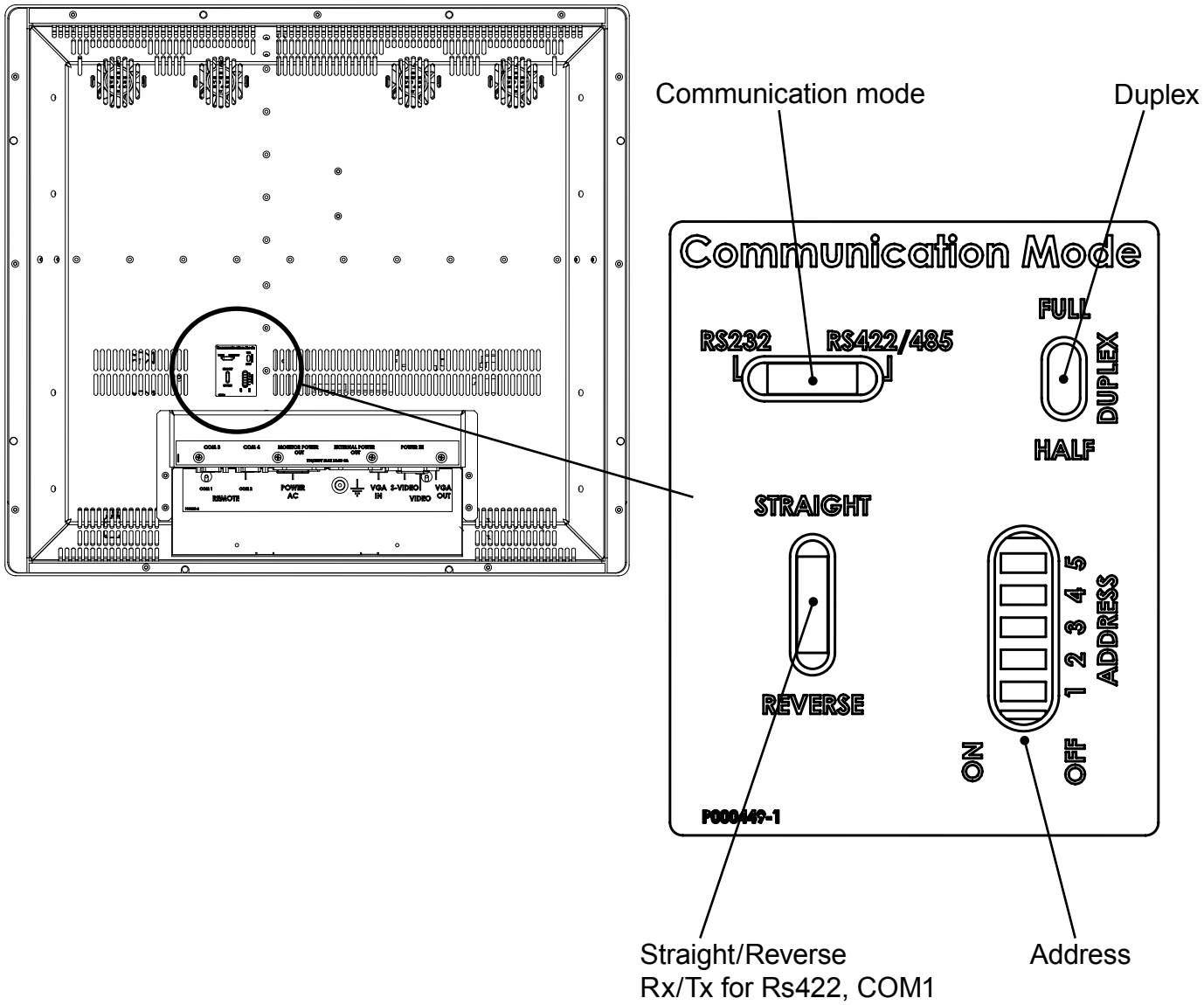
		Communication mode (U5)	Duplex (U8)
RS-232		RS232	-
RS-485	Full duplex	RS422/485	Full (on)
	Half duplex		Half (off)

These settings are normally carried out by JHD before delivery.

Communication settings

The communication options are set by switches, placed at the backside of the display. For most displays (MMD), these switches are labelled like seen on the pictures below. For adjustments, a thin object is required for reaching the switches. Some displays do not have this label or the dedicated holes. To change the settings, these switches can either be reached through the ventilation holes or the back cover must be demounted.

NOTE: The placement of the switches may vary from product to product!
Please see the "Physical Connections" section in this manual for reference.



COMMAND TABLE

Commands to implement switch mount control buttons

Function	Command	Description	Remark
Menu button	0xf7	Menu button pressed	Button equivalent
Select-down button	0xfa	Select-down button pressed	Button equivalent
Select-up button	0xfb	Select-up button pressed	Button equivalent
Right/+ button	0xfc	Right/+ button pressed	Button equivalent
Left/- button	0xfd	Left/- button pressed	Button equivalent

Parameter setting - immediate, relative, reset and query

Function	Command	Description	Acknowledge (if enabled)
Brightness control	0x81, nn | “+” | “-” | “r” | “R” | “?”	Set brightness = Value increment/decrement Reset Query	Brightness.
Contrast control - all channels	0x82, “a” | “A”, nn | “+” | “-” | “r” | “R” | “?”	Set all contrast = Value increment/decrement Reset Query	Contrast red.
Colour temp-erature select	0xb3, n | “r” | “R” | “?”	Select colour temperature = Value Reset Query	“0” – 9500K. “1” – 8000K. “2” – 6500K. “3” – 5000K.
Contrast control - red channel	0x82, “r” | “R”, nn | “+” | “-” | “r” | “R” | “?”	Set red contrast = Value increment/decrement Reset Query	Contrast red.
Contrast control - green channel	0x82, “g” | “G”, nn | “+” | “-” | “r” | “R” | “?”	Set green contrast = Value increment/decrement Reset Query	Contrast green.
Contrast control - blue channel	0x82, “b” | “B”, nn | “+” | “-” | “r” | “R” | “?”	Set blue contrast = Value increment/decrement Reset Query	Contrast blue.
Phase (tuning) control	0x85, nn | “+” | “-” | “r” | “R” | “?”	Set dot clock phase = Value increment/decrement Reset Query	Dot clock phase. (In PC mode only)
OSD status enquiry	0xbb	Status of OSD	“0” – OSD turned off “1” – OSD turned on
Image H position	0x86, nnnn | “+” | “-” | “r” | “R” | “?”	Set img_hpos = Value increment/decrement Reset Query	Image horizontal position.

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Function	Command	Description	Acknowledge (if enabled)
Image V position	0x87, nnnn | "+" | "-" | "r" | "R" | "?"	Set img_vpos = Value increment/decrement Reset Query	Image vertical position.
PIP window size select	0xa6, n | "r" | "R" | "?"	Select PIP window size = PIP window size value Reset Query	Main selected. "0" – PIP off. "1" – smallest PIP size. "2"- "9" – other PIP size. * max size for SVP1280 is "3"
PIP source select	0xa7, n | "r" | "R" | "?"	Select input main = Video source value Reset Query	Main selected. "0" – auto. "1" – Composite video. "2" – S-video. "3" – Component video.
PIP H position	0xa4, nnn | "+" | "-" | "r" | "R" | "?"	Set PIP_hpos = Value increment/decrement Reset Query	PIP window horizontal pos.
PIP V position	0xa5, nnn | "+" | "-" |	Set PIP_vpos = Value increment/decrement	PIP window vertical position.
	"r" | "R" | "?"	Reset Query	
PIP brightness control	0xa2, nn | "+" | "-" |	Set PIP window brightness = Value increment/decrement	PIP window brightness.
	"r" | "R" | "?"	Reset Query	
PIP contrast control	0xa3, nn | "+" | "-" |	Set PIP window contrast = Value increment/decrement	PIP window contrast.
	"r" | "R" | "?"	Reset Query	
Tint control	0x84, nn | "+" | "-" | "r" | "R" | "?"	Set tint = Value increment/decrement Reset Query	NTSC tint (In NTSC mode only)
Color control	0x83, nn | "+" | "-" | "r" | "R" | "?"	Set color = Value increment/decrement Reset Query	PAL/NTSC color (In video mode only)
Red level for selected colour temperature	0xb4, nn | "+" | "-" | "r" | "R" | "?"	Set the level of the red channel for the selected colour temp. = Value increment/decrement Reset Query	Red level for selected colour temperature.
Green level for selected colour temperature	0xb5, nn | "+" | "-" | "r" | "R" | "?"	Set the level of the green channel for the selected colour temp. = Value increment/decrement Reset Query	Green level for selected colour temperature.

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Function	Command	Description	Acknowledge (if enabled)
Blue level for selected colour temperature	0xb6, nn | "+" | "-" | "r" | "R" | "?"	Set the level of the blue channel for the selected colour temp. = Value increment/decrement Reset Query	Blue level for selected colour temperature.
Video System	0x9b, "0" | "1" | "2" | "3" | "r" | "R" | "?"	Set video system = Auto/NTSC/PAL/SECAM Reset Query	"0" – Auto. "1" – NTSC_M_358 "2" – PAL_N_443 "3" – SECAM "4" – NTSC_M_443 "5" - PAL_M_358 "6" – NTSC_N_358 "7" – PAL_M_443
Rotate video image	0xc7, "0" | "1"	Disable/enable video rotate	"0" – normal video image. "1" – rotated video image.
Scaling Mode	0x8c, "0" | "1" | "2" | "3" "r" | "R" | "?"	Set graphic image scaling mode = Value Reset Query	Image expansion on/off. "0" – 1:1. "1" – fill screen. "2" – fill to aspect ratio "3" – non-linear scaling "4" – expand letterbox video to fill screen "5" – expand letterbox video (with subtitles) to fill screen "6" – keep aspect ratio of 4:3 video on 16:9 screen "7" – expand 4:3 letterbox video to aspect ratio (on 16:9 screen) "8" – expand 4:3 letterbox video (wiih subtitles) to aspect ratio (on 16:9 screen)
Select OSD language	0x95, n | "r" | "R" | "?"	Select language = Value Reset Query	"0" – English. "1" – Italian. "2" – French. "3" – Spanish. "4" – Swedish. "5" – Dutch. "6" – German. "7" – Danish "8" – Chinese
Input main select	0x98, n | "+" | "-" | "r" | "R" | "?"	Select input main = PC or VIDEO or next available Reset Query	Main selected. "0" – PC. "1" – Composite video. "2" – S-video. "3" – Component video. For ACL-1280 & MAV-1280 "0" – PC. "1" – VIDEO.

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Function	Command	Description	Acknowledge (if enabled)
Select menu timeout	0x93, nn | "+" | "-" | "r" | "R" | "?"	Select menu timeout = Value increment/decrement Reset Query	OSD menu timeout value. "00" – Continuous. value – Round up to nearest available step. if value > max available step, set it to the max available step.
Power Down / DPMS Option	0x9f, "0" | "1" | "r" | "R" | "?"	Set power down option = On/Off Reset Query	"0" – Off. "1" – On.
Display Video Source Select	0xbc, "?" | "0" | "1"	Query Name of video source not displayed. After switching to a new video source is displayed for 5 seconds.	"0" – disabled. "1" – enabled.
GAMMA value select	0x9d, n | "r" | "R" "?"	Select GAMMA value = Value Reset Query	GAMMA value: "0" – 1.0 "1" – 1.6 "2" – 2.2
OSD H position	0x90, nnn | "+" | "-" | "r" | "R" | "?"	Set osd_hpos = Value increment/decrement Reset Query	OSD horizontal position.
OSD V position	0x91, nnn | "+" | "-" | "r" | "R" | "?"	Set osd_vpos = Value increment/decrement Reset Query	OSD vertical position.
OSD Transparency	0x92, n | "+" | "-" | "r" | "R" | "?"	Set OSD transparency = Value increment/decrement Reset Query	OSD tranparency.
Rotate OSD	0x8f, "0" | "1"	Disable/enable OSD rotate	"0" – normal OSD. "1" – rotated OSD.
Freeze frame	0xc6, "0" | "1"	Unfreeze / freeze frame	"0" – unfreeze. "1" – freeze.
Zoom level	0xa8, nn | "+" | "-" | "r" | "R" | "?"	Set Zoom level = Value increment/decrement Reset Query	Zoom level.
Scalar H pan position	0xb1, nnn | "+" | "-" | "r" | "R" | "?"	Set horizontal pan position for 1:1 scale mode = Value increment/decrement Reset Query	Scalar horizontal pan position.

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Function	Command	Description	Acknowledge (if enabled)
Scalar V pan position	0xb2, nnn | "+" | "-" | "r" | "R" | "?"	Set vertical pan position for 1:1 scale mode = Value increment/decrement Reset Query	Scalar vertical pan position.
Direct Access (Hotkeys)	0xa0, "1", n | "r" | "R" | "?"	Set Hotkey 1= Value Reset Query	"0" – audio mute. "1" – volume. "2" – brightness. "3" – contrast. "4" – color. "5" – input source. "6" – video input. "7" – zoom "8" – freeze "9" – PIP
Direct Access (Hotkeys)	0xa0, "2", n | "r" | "R" | "?"	Set Hotkey 2 = Value Reset Query	"0" – audio mute. "1" – volume. "2" – brightness. "3" – contrast. "4" – color. "5" – input source. "6" – video input. "7" – zoom "8" – freeze "9" - PIP
Set display orientation Auto-calibration	0x8e, n | "r" | "R" | "?" 0xc5	Set display orientation = Value increment/decrement Reset Query Start auto-calibration of gain of the RGB amplifier.	"0" – normal. "1" – vertical inverse. "2" – horizontal inverse. "3" – inverted. "0" – fail. "1" – successful.
Set gamma data for user defined gamma curve	0xbf, mm, c, "?" 0xbf, "R" | "r" 0xbf, mm, c, nn	Query gamma data for color c index mm (c = 0 for color Red, C = 1 for color Green, c = 2 for color Blue) Set user gamma curve to linear Set gamma data for color c index mm. (If c = 3, then gamma data for red, green & blue will be set at the same time)	"nn" = gamma data "1" "nn" = gamma data
Soft Power On/Off	0xc8 "0" | "1" | "?"	Soft power off/on query	"0" - soft power off "1" - soft power on

Function	Command	Description	Acknowlwdge (if enabled)
Query video input status	0xc9	Query the status of the primary & pip status	"nn" = input status 2nd digit = primary status: "0" : invalid "1" : connected to valid RGB "2" : connected to valid composite "3" : connected to valid Svideo "4" : connected to valid YcbCr 1st digit = PIP input status: "0" : invalid "2" : connected to valid composite "3" : connected to valid Svideo "4" : connected to valid YcbCr
Video de-interlace method	0xca, "0" | "1" "r" | "R" "?"	 De interlace mode Reset Query	"0" - motion video. "1" - static picture. "2" - normal (non-flicker video mode)
Query BIOS version	0xcb, "0"	Read BIOS version	"nnnn" = BIOS ver. "nn.nn"
Query PCBA number	0xcb, "1"	Read PCBA number	"nnnn" = PCBA number
Query average picture level	0xcc, "0" | "1" "2"	Read APL for red channel Read APL for green channel Read APL for blue channel	"nn" = average picture level
Test Pattern	0xcd, "0" | "1"	Leave test pattern display mode Display test pattern screen	"0" = normal display "1" = display built in test pattern
Reset parameter	0xce	Reset all parameters to default value	"1" - successful.
Reset all parameter	0xcf	Reset all parameters for all video modes to default value	"1" - successful.

n = 1-byte ascii-coded hex number, e.g., parameter value of 0x1 is represented by "1" (0x31).
nn = 2-byte ascii-coded hex number, e.g., parameter value of 0x1e is represented by "1", "e" | "E" (0x31, x6e|0x4e).

Remarks:

1. Command 0xcd is only available for new displays (8/5-03).
2. If the data sent to the controller is out of range, the controller will not set that value and there will be no acknowledgement.
3. If the command sent to the controller is not available for that controller, there will be no acknowledgement.
4. The controller will respond to RS-232 command when the controller is in standby, no video input or normal operating condition.
5. If the following parameters are changed through RS-232: Power Down Option, Exclusive/Priority, Input Source, Video Input, the controller should change state according to the latest setting immediately.

Revision History - JHSCOM

Rev.	By	Date	Notes
1	LM	26nov01	Preliminary release.
1	LM	06mar02	1’st Release Remote control interface specification
2	LM	06mar02	Changed Pin description for Half duplex RS-485.
2	TK	17oct02	Renamed document description to Specification of Serial Communication Control Interface. Corrected Pin assignment of RS-232 (Tx and Rx).
3	LM	22oct02	Added new MCC commands. Added Block diagram. Added paragraph about setting desired communication mode.
3	LM	08may03	Corrected example for MCC command (50% contrast).
3	SE	11Aug03	Minor spell checking and text formatting.
4	SE	19Feb04	Added note about physical placement of the DIP switches. (May vary from product to product)

Appendix

Safety Warnings

NOTE!

If you are to perform service on the unit, please note that any warranty will be void. These instructions are for experienced personnel only, and can be done when the unit is not under warranty from Jakob Hatteland Display.

CAUTION
This unit contains electrostatic sensitive devices.
Observe precautions for handling.

The discharge of electrostatic energy into a semiconductor can destroy the semiconductor or change its properties. Before opening a display's housing to remove or touch a board, proper ESD measurements must be taken.

1. Before repair work, operator should ground himself by putting on a wrist band.
2. The wrist band should be connected to ground via a ground cord.
3. A one megaohm resistor, installed in the wrist connection end of the ground cord, is a safety requirement.
4. Work table and floor of work area should be covered with electrostatic shielding in order to discharge static electricity via an earth wire.
5. Alternatively an Static-dissipative ESD work mat must be positioned at the workplace. The 3M™ 8501 Portable Field Service Kit is a good choice for this purpose.
6. Thoroughly grounded soldering, measurement and test tools must be used.
7. Do not disassemble the LCD panel under low humidity (50% RH or less).

All assisting persons who might come into contact with the endangered boards must also use the ESD equipment.

DANGER

Even when the display is switched off, there will be a dangerous voltage present on exposed contacts inside. Therefore, before a unit is opened, it must be ensured that the power cord is removed from the power inlet.

Capacitors in the AC powersupply can store dangerous voltages for several hours, even when they have been disconnected from the supply voltage.

WARNING

1. Pay attention to the regulations for the prevention of accidents.
2. When parts replacement is required for servicing, always use the manufacturer's specified replacement.
3. When replacing the component, always be certain that all the components are put back in place.
4. Make sure all connectors are properly connected before reassembling and switching on power.
5. Use a proper Screwdriver. If you use a screwdriver that does not fit, you may damage the screws.

Handling LCD panel

(when replacing panel or backlight lamp)

1. Do not apply any strong mechanical shock to the LCD panel
   Since this LCD panel is made of glass, excessive shock may damage the panel or cause a malfunction.

2. Do not press hard on the LCD panel surface.
   In the LCD panel, the gap between two glass plates is kept perfectly even to maintain display properties and reliability. Any hard pressure on the LCD panel may cause the following problems:
   - Ununiformity of color
   - Disorder of orientation of liquid crystal
   Problem returns to normal condition after a while or by turning power off and on again.
   However these operations should be avoided to insure reliability.

3. Do not scratch the polarizing film on the LCD panel surface.
   - Do not press or rub the display surface with a hard tool, tweezers, etc.
   - For handling, use cotton or conductive gloves so that the display surface is not soiled.

Cleaning LCD panel

If dust or dirt soils the display surface, clean it as follows with a soft dry cloth without chemicals.

Dust - Wipe off with a soft cloth. (do not rub.)

Dirt - Apply clear water to a soft cloth and squeeze hard out of water drops, then lightly wipe off the specified parts. Only if the dirt is hardly wiped off, use isopropyl alcohol or ethanol. Be careful not to splash the water or the solvents on the edge of polarizer and in the LCD unit. The polarizer possibly exfoliates due to the solvent and water penetrated between the polarizer and the LCD panel.

Caution !
* Do not use unspecified solvent such as ketone (acetone, etc.) and aromatics (xylene, toluene, etc)
* Be careful not to allow the water of solvent to enter the module.
* If solvent or water drops are left for a long period of time, the part may become deformed or discolored.
* Wipe off immediately in the same way as for dirt.
* Do not allow oil to adhere to the module since excessive oil is hard to clean.

Please note: Even although the test conditions for bridge units provide for a maximum operating temperature of 55°C, continuous operation of all electronic components should, if possible, take place at ambient temperatures of only 25°C. This is a necessary prerequisite for long life and low service costs.

Basic Trouble-shooting

COMMON ERRORS:
If for some reason there should be something wrong with the picture quality or no picture present, check the symptoms carefully and try to cure it with the hints below:

NO PICTURE / LED BEHAVIOUR:
Power Switch and computer power switch should be in the ON position. The signal cable should be completely connected to the video card/computer. Check the connector for bent or pushed-in pins. If the LED in front is red, no external VGA signal is present. If there is no light at all in the LED, try to turn the brightness knob. If it's still black, no power is present to the unit. Check your external power source. A lack of image is most likely to be caused by incorrect connection, lack of power, failure to provide a signal or incorrect graphic card settings.

SCROLLING / UNSTABLE IMAGE:
Signal cable may not be completely connected to computer or TFT display.
Check the pin assignments and signal timings of the display and your video card with respect to recommended timing and pin assignments. Make sure that the video card is compatible and that it is properly seated / installed on the computer.

DISPLAY AREA IS NOT CENTERED / SIZED CORRECTLY
Make sure that a supported video mode has been selected on the display, or on the video card / system. If it is impossible to position the image correctly, ie the image adjustment controls will not move the image far enough, then test it again using another graphics card for the PC system. This situation can occur with a custom graphics card that is not close to standard timings or if something is in the graphics line that may be affecting the signal, such as a signal splitter (please note that normally a signal splitter will not have any adverse effect).

IMAGE APPERANCE:
A faulty TFT panel can have black lines, pixel errors, failed sections, flickering or flashing image. Incorrect graphics card refresh rate, resolution or interlaced mode will probably cause the image to be the wrong size, it may scroll, flicker badly or possibly even no image is present. Sparkling on the display may be a faulty TFT panel signal cable.

CONTINUED FAILURE:
If unit after unit keeps failing, consider and investigate whether you are short circuiting the equipment or doing something else seriously wrong.

DEW CONDENSATION BEHIND GLASS:
Power on the TFT product and set brightness to 100%. Turn off any automatic screensavers on PC or similar. During minutes the dew will be gone. To speed up the process, use a fan heater for a reasonable time. Do not overheat the TFT product.

The Hatteland Group - Terms Of Sale And Delivery:

1) APPLICATION
The terms of sale and delivery include the following companies: Autostore AS, Jakob Hatteland Assembly AS, Jakob Hatteland Computer AS, Jakob Hatteland Display AS, Jakob Hatteland Logistics, Jakob Hatteland Supply AS and Jakob Hatteland Technology AS.

2) PRICE
a) The price is per each, if nothing else has been stated, VAT not included. Price is based on the prices from our suppliers, current custom rates, taxes, rate of exchange and international raw material prices. We reserve ourselves the rights to adjustments in case of alternation on the above mentioned.
b) Included in the price is the supplier's standard packing. In case of re-packing/smaller quantities we reserve ourselves the right to add an additional sum for warrantable packing according to CECC 0015 (Basic inspection for protection of electrostatic sensitive devices)

3) VALIDITY
If nothing else has been stated in our quotation, the offer is valid for 30 days from the date of quotation.

4) PACKAGE QUOTATION
A package quotation means that all the components offered, must be ordered by us. If one component or more are removed from the quotation, the prices given in the package quotation are not valid.

5) TERMS OF PAYMENT
Cash on delivery or payment in advance. Net granted for companies, schools and institutions only, according to agreement. In case of too late payment 1.5% interest/month will be charged. Seller has mortage rights in the goods delivered until the purchase price, additional interests and charges have been paid in full. Accepted bill is not considered as payment until it has been honoured in full.

6) TIME OF DELIVERY
The quoted time of delivery is based on information from our suppliers. We disclaim any responsiblity for the consequences of any delay or cancellation from our suppliers. Belated delivery gives not solely the right for cancellation.

7) DELIVERY POINT OF TIME
Goods are considered delivered to customer when handed over to charterer.

8) FREIGHT / PACKING / FORWARDING FEE
Jakob Hatteland Display AS charg NOK 50 in forwarding fee for orders below NOK 1.000. For orders below NOK 1.000 Jakob Hatteland Supply AS charge freight according to expenses, and NOK 25 for packing. For handling requested beyond ordinary hours NOK 250 is charged. Express service is charged with NOK 100 + freight charges. All the companies charge freight according to expenses for orders above NOK 1.000. VAT not included.

9) COMPLAINT
By receipt customer must check goods for obvious defects which have to be claimed within 8 days from receipt. Otherwise acceptance of complaint can not be counted on.

10) GUARANTEE / SERVICES
Time of guarantee is calculated from our date of shipment, and applies to the extent that we are covered by our supplier's guarantee regulations. The guarantee does no longer apply if:

I) there has been encroached upon the goods without seller's consent
II) terms of payment is not fulfilled
III) the goods have been damaged due to unskilled treatment
IV) components which are sensitive for static electricity have not been unpacked and treated in a secure way. Minimum requirements: CECC 00015's standards for handling of such components. The guarantee does not include fair wear and tear.

11) RESPONSIBLITY
Seller undertake to deliver faultless and functional capable goods according to existing technical specifications. Seller disclaim responsibility for any damage or loss which directly or indirectly may be caused due to failure or defect with the delivered goods, if carelessness from the seller can be limited up to the cost of the goods. The supplier's responsibility for defects with the supplied goods do not include secondary damage or loss.

12) CANCELLATION / RETURN
Binding sales contract is concluded when we have confirmed customer's purchase order. Any disagreements in our order confirmation must be reported to seller within 6 days. The agreement can not be altered without our permission, after acceptance from our supplier. If goods are wanted to be returned, a Return No must be assigned from seller. Returned goods without a Return No will not be accepted. By return of stock listed goods, 20% return fee is charged. Returned goods are shipped on customer's account and risk.

13) LOAN, RENT and DEMO
When borrowing of goods for demo/test, the date of return must be added to the document. If no date has been stated, date of return is two weeks from the date of the document. Before return, seller must be contacted for a Return No (RTK). Goods which have been sold with an agreed right of return within stated terms, shall also have a Return No. The Return No must be obtained before the stated date of return. Returned goods without a Return No, or which have not been packed in original packing, will not be accepted.

14) LIMITATIONS
If any of our suppliers claim limited delivery terms towards us, our terms of delivery will be restriced according to those.

15) SOFTWARE
Sold or borrowed software is not allowed to be copied or spread in other ways, without a written permission.

16) RE-EXPORT
Goods delivered from seller may be subject to special rules of exportation in their supplier's native country. Buyer is responsible to obtain necessary permissions for further export/re-sale.

17) QUESTION IN DISPUTE
To settle any dispute the Karmsund Herredsrett is approved the legal venue.

INSTRUCTIONS FOR THE CONSIGNEE

1) CONTROL

Control the goods immediately by receipt. Examine the quantity towards the invoice/packinglist/shipping documents. Look for outward defects on the packing which may indicate damage on or loss of contents. Control the container and the seals for any defects.

2) SECURING EVIDENCE

When defects on the goods have been found, evidence must be secured, and seller must be informed. Call the transporter and point out the defects. Add a description of the defects on the goods receipt, the forwarder's copy of the way-bill or on the driving slip.

3) RESCUE

Bound the damage. Try to restrict the damage and the loss. Seller will compensate expences incurred due to reasonable security efforts in addition to damage and loss.

4) COMPLAINT

Write immediately a complaint to the transporter or his agent. Forward immediately the complaint to the transporter or his agent, and hold the transporter responsible for the defects. The complaint must be sent at the latest:

- for carriage by sea: within 3 days
- for overland / air transportation within 7 days

5) DOCUMENTATION

For any claims the following documentation is required, and must be forwared to the company or their agent:
invoice, way-bill and/or bill of landing, and/or statement of arrival, inspection document, besides a copy of the letter of complaint to the transporter.

Return Of Goods Information

Return of goods: (Applies not to warrenty/normal service/repair of products)
Before returning goods, please contact your system supplier before sending anything directly to JHD. When you return products after loan, test, evaulation or products subject for credit, you must ensure that all accessories received from our warehouse is returned to JHD.
This applies to cables, powermodules and additional equipment except screws or similar, user manual, datasheets or other written paper documents. Furthermore, the product must not have any (minor) + medium or severe scratches, chemical spills or similar on the backcover, front frame or glass.

This is needed to credit the invoice 100%. Missing parts will not be subject for credit, and you will not get total credit for returned product. You will either be charged separately or the amount is withdrawn from the credit. If you noticed that our product missed accessories upon receival, we are of course open for further investigation and positive solutions. If you decide to ship the missing items on the after hand, you will get 100% credit for that particular invoice or items received at JHD incoming goods control. Please contact our sales personnel if additional questions.

Current prices apply as per Desember 2002:

Signal Cable DSUB 15P Male or Female - Approx 1,8meters	Price: 170,- NOK each
Signal Cable BNC 5P - Approx 1,8meters	Price: 350,- NOK each
RS-232 serial cable DSUB 9P - Approx 1,8meters	Price: 80,- NOK each
Powercable 110 / 220 VAC (European or US standard) - Approx 1,8meters	Price: 50,- NOK each
(Minor) + Medium or severe scratches / chemical spill on backcover or front frame	Price: 1300,- NOK
Any scratch, chemical spill or similar on front glass	Price: 1000,- NOK

Approved packaging methods/materials: (Applies to all shipments to JHD)
When returning goods, please make sure you surround the product with the following material, whenever possible: Original packaging from JHD, firm foam material, bubble wrap or lots of PadPack paper or Foam chips/polyester wrapped in sealed plastic bags. In any case, always use a solid cardboard box to surround everything.

Not approved packaging methods/materials are: Foam chips, expanded polyester, clothes, nothing, or too little, or anything that will crumble and get into the ventilation holes of products and cardboard boxes that are not suitable to secure the product during shipment.

Additional testing and approvals overview - JH 19T01 MIL:

EXTENDED TESTING (In addition to IEC 60945):

TEST	LEVEL	SPECIFICATION
Dry heat storage	70°	IEC 60068-2-2 (1974), Test Bd
Cold storage	-40°	IEC 60068-2-1 (1990), Test Ad
Resonance search	4-33 Hz @ 2g No resonance above 2	IEC 60068-2-6 (1995), Test Fc
Endurance Vibration	4-33 Hz @ +/-5mm, 2g	IEC 60068-2-6 (1995), Test Fc
Shock	50g / 11ms	IEC 60068-2-27 (1987), Test Ea
Transient Shock	2-280 Hz Designed to envelope a half sine shock pulse of 50g / 35ms	IEC 60068-2-57 (1999-11), Test Ff
Rain (drip proof)	-	MIL-STD-810F (Console mounted)
Salt Fog	-	MIL-STD-810F (Console mounted)

The unit has been EMI tested according to the following:

MIL-STD 461E, 1999
MIL-STD 462E, 1999

- CE 101 - Conducted emission, 30 Hz - 10 kHz
- CE 102 - Conducted emissions, 10 kHz - 10 Mhz
- CS 101 - Conducted susceptibility, 30 Hz - 50 kHz
- CS 114 - Conducted susceptibility, 10 kHz - 200 MHz
- CS 116 - Conducted susceptibility, damped oscillatory waves
- RE 101 - Radiated emission, H-field, 30 Hz - 100 kHz
- RE 102 - Radiated emissions, E-field, 10 kHz - 10 GHz
- RS 101 - Radiated susceptibility, H-field, 30 Hz - 100 kHz
- RS 103 - Radiated susceptibility, E-field, 2 MHz - 18 GHz

Other:
- Transient immunity, 100 ns risetime, 10 µs duration, 325 V_{PEAK}
- Supply voltage variation test, 98 -> 276 VAC, 47 -> 63.6 Hz
- Measurements of power consumption = 42W
- Measurements of inrush current = 4 A_{PEAK}

JH 19T01 MIL have been tested / type approved by the following classification societies:

EN60945 3rd (IEC945 3rd) **MIL-STD 462E, 1999**
MIL-STD 461E, 1999

Additional testing and approvals overview - JH 20T03 MIL:

EXTENDED TESTING (In addition to IEC 60945):

TEST	LEVEL	SPECIFICATION
Dry heat storage	70°	IEC 60068-2-2 (1974), Test Bd
Cold storage	-40°	IEC 60068-2-1 (1990), Test Ad
Resonance search	4-33 Hz @ 2g No resonance above 2	IEC 60068-2-6 (1995), Test Fc
Endurance Vibration	4-33 Hz @ +/-5mm, 2g	IEC 60068-2-6 (1995), Test Fc
Shock	50g / 11ms	IEC 60068-2-27 (1987), Test Ea
Transient Shock	2-280 Hz Designed to envelope sine shock pulse of 50g / 35ms	IEC 60068-2-57 (1999-11), Test Ff
Rain (drip proof)	280 l/m^2/hour at 15min pr. orientation	MIL-STD-810F (Console mounted)
Salt Fog	-	MIL-STD-810F (Console mounted)

The unit has been EMI tested according to the following:

MIL-STD 461D, 1993
MIL-STD 462D, 1993

- CE 101 - Conducted emission, 30 Hz - 10 kHz
- CE 102 - Conducted emissions, power leads, 10 kHz - 10 Mhz
- CS 101 - Conducted susceptibility, 30 Hz - 50 kHz
- CS 114 - Conducted susceptibility, 10 kHz - 200 MHz
- CS 116 - Conducted susceptibility, damped oscillatory waves
- RE 101 - Radiated emission, magnetic field, 30 Hz - 100 kHz
- RE 102 - Radiated emissions, electric field, 10 kHz - 18 GHz
- RS 101 - Radiated susceptibility, H-field, 30 Hz - 100 kHz
- RS 103 - Radiated susceptibility, electric field, 2 MHz - 18 GHz

Other:
- Transient immunity, 100 ns risetime, 10 µs duration, 325 V_{PEAK}
- Supply voltage variation test, 98 -> 138 VAC, 56.4 -> 63.6 Hz
- Measurements of power consumption = 76W
- Measurements of inrush current = 4 A_{PEAK}

JH 20T03 MIL have been tested / type approved by the following classification societies:

EN60945 3rd (IEC945 3rd)
BV - Bureau Veritas

Additional testing and approvals overview - JH 20T04 MIL:

EXTENDED TESTING (In addition to IEC 60945):

TEST	LEVEL	SPECIFICATION
Dry heat storage	70˚	IEC 60068-2-2 (1974), Test Bd
Cold storage	-40˚	IEC 60068-2-1 (1990), Test Ad
Resonance search	4-33 Hz @ 2g No resonance above 2	IEC 60068-2-6 (1995), Test Fc
Endurance Vibration	4-33 Hz @ +/-5mm, 2g	IEC 60068-2-6 (1995), Test Fc
Shock	50g / 11ms	IEC 60068-2-27 (1987), Test Ea
Transient Shock	2-280 Hz Designed to envelope a half sine shock pulse of 50g / 35ms	IEC 60068-2-57 (1999-11), Test Ff
Rain (drip proof)	-	MIL-STD-810F (Console mounted)
Salt Fog	-	MIL-STD-810F (Console mounted)

The unit has been EMI tested according to the following:

MIL-STD 461E, 1999
MIL-STD 462E, 1999
MIL-STD 901D, Shock Test, Hard-mounted

- CE 101 - Conducted emission, 30 Hz - 10 kHz
- CE 102 - Conducted emissions, 10 kHz - 10 Mhz
- CS 101 - Conducted susceptibility, 30 Hz - 50 kHz
- CS 114 - Conducted susceptibility, 10 kHz - 200 MHz
- CS 116 - Conducted susceptibility, damped oscillatory waves
- RE 101 - Radiated emission, H-field, 30 Hz - 100 kHz
- RE 102 - Radiated emissions, E-field, 10 kHz - 10 GHz
- RS 101 - Radiated susceptibility, H-field, 30 Hz - 100 kHz
- RS 103 - Radiated susceptibility, E-field, 2 MHz - 18 GHz

Other:
- Transient immunity, 100 ns risetime, 10 µs duration, 325 V_{PEAK}
- Supply voltage variation test, 98 -> 276 VAC, 47 -> 63.6 Hz
- Measurements of power consumption = 50W
- Measurements of inrush current = 4 A_{PEAK}

JH 20T04 MIL have been tested / type approved by the following classification societies:

EN60945 3rd (IEC945 3rd)
MIL-STD 461E, 1999
MIL-STD 462E, 1999
MIL-STD 901D, Shock Test, Hard-mounted

Additional testing and approvals overview - JH 23T02 MIL:

EXTENDED TESTING (In addition to IEC 60945):

TEST	LEVEL	SPECIFICATION
Dry heat storage	70˚	IEC 60068-2-2 (1974), Test Bd
Cold storage	-40˚	IEC 60068-2-1 (1990), Test Ad
Resonance search	4-33 Hz @ 2g No resonance above 2	IEC 60068-2-6 (1995), Test Fc
Endurance Vibration	4-33 Hz @ +/-5mm, 2g	IEC 60068-2-6 (1995), Test Fc
Shock	50g / 11ms	IEC 60068-2-27 (1987), Test Ea
Transient Shock	2-280 Hz Designed to envelope a half sine shock pulse of 50g / 35ms	IEC 60068-2-57 (1999-11), Test Ff
Rain (drip proof)	-	MIL-STD-810F (Console mounted)
Salt Fog	-	MIL-STD-810F (Console mounted)

The unit has been EMI tested according to the following:

MIL-STD 461E, 1999
MIL-STD 462E, 1999

- CE 101 - Conducted emission, 30 Hz - 10 kHz
- CE 102 - Conducted emissions, 10 kHz - 10 Mhz
- CS 101 - Conducted susceptibility, 30 Hz - 50 kHz
- CS 114 - Conducted susceptibility, 10 kHz - 200 MHz
- CS 116 - Conducted susceptibility, damped oscillatory waves
- RE 101 - Radiated emission, H-field, 30 Hz - 100 kHz
- RE 102 - Radiated emissions, E-field, 10 kHz - 10 GHz
- RS 101 - Radiated susceptibility, H-field, 30 Hz - 100 kHz
- RS 103 - Radiated susceptibility, E-field, 2 MHz - 18 GHz

Other:
- Transient immunity, 100 ns risetime, 10 µs duration, 325 V_{PEAK}
- Supply voltage variation test, 98 -> 276 VAC, 47 -> 63.6 Hz
- Measurements of power consumption = TBD
- Measurements of inrush current = 4 A_{PEAK}

JH 23T02 MIL have been tested / type approved by the following classification societies:

EN60945 3rd (IEC945 3rd)
MIL-STD 461E, 1999
MIL-STD 462E, 1999

Notes

General Notes: (For all products)

- The unit is type approved according to EN60945 (1997), 4.4, equipment category b) protected from the weather.

- Other type approvals applies for the different products.
  Please see **Testing & Approvals Overview** section in this manual for more information.

- Use of brightness and push buttons may inhibit visibility of information at night.

VGA BIOS Firmware Verify: (On MMD and similar products only)

To verify your BIOS Firmware version, the version number is displayed in the UTILITIES menu in the right top corner. If no version number shows, you may have a BIOS Firmware below V1.00

This manual currently applies for these BIOS Firmware Versions:
V0.xx / V1.00 / V1.10 / V1.2 / V1.2xx / V1.3xx / V1.5xx / V1.6xx

As the available functions are nearly indentical between older products and V1.6xx, there should be no critical need to update the BIOS Firmware. In such case, consult your local technician or sales/technical personnel at Hatteland Display if problems arise during the installation or within usage of the product, or lack of support for your signal refresh rate etc.

VGA BIOS Firmware Versions: (On MMD and similar products only)

On products from V0.xx to V1.1xx = The **advanced** version of the OSD menu by startup default.
On products from V1.2xx to V1.5xx = The **simplified** version of the OSD menu by startup default.
On products from V1.6xx = The **memorized state** version of the OSD menu by startup default.

Advanced/Service Menu:
You will have a full set of functions available for your personal perference. Only for experienced users.

Simplified Menu:
You will have a limited set of functions available for your personal perference. For the common user.

Memorized State Menu:
The menu will either be advanced or simplified upon startup of display. If user changes from simplified to advanced menu or visa versa, then this will be memorized in memory and it stays in that mode until user changes it back again. This is only active on VGA BIOS Firmware versions from V1.6xx and above.

Revision History

Rev.	By	Date	Notes
1	SE	12 Feb 04	First release, User Manual. Pressed & internet version.
2	SE	18 Mar 04	Updated EMI test specifications and datasheets.

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